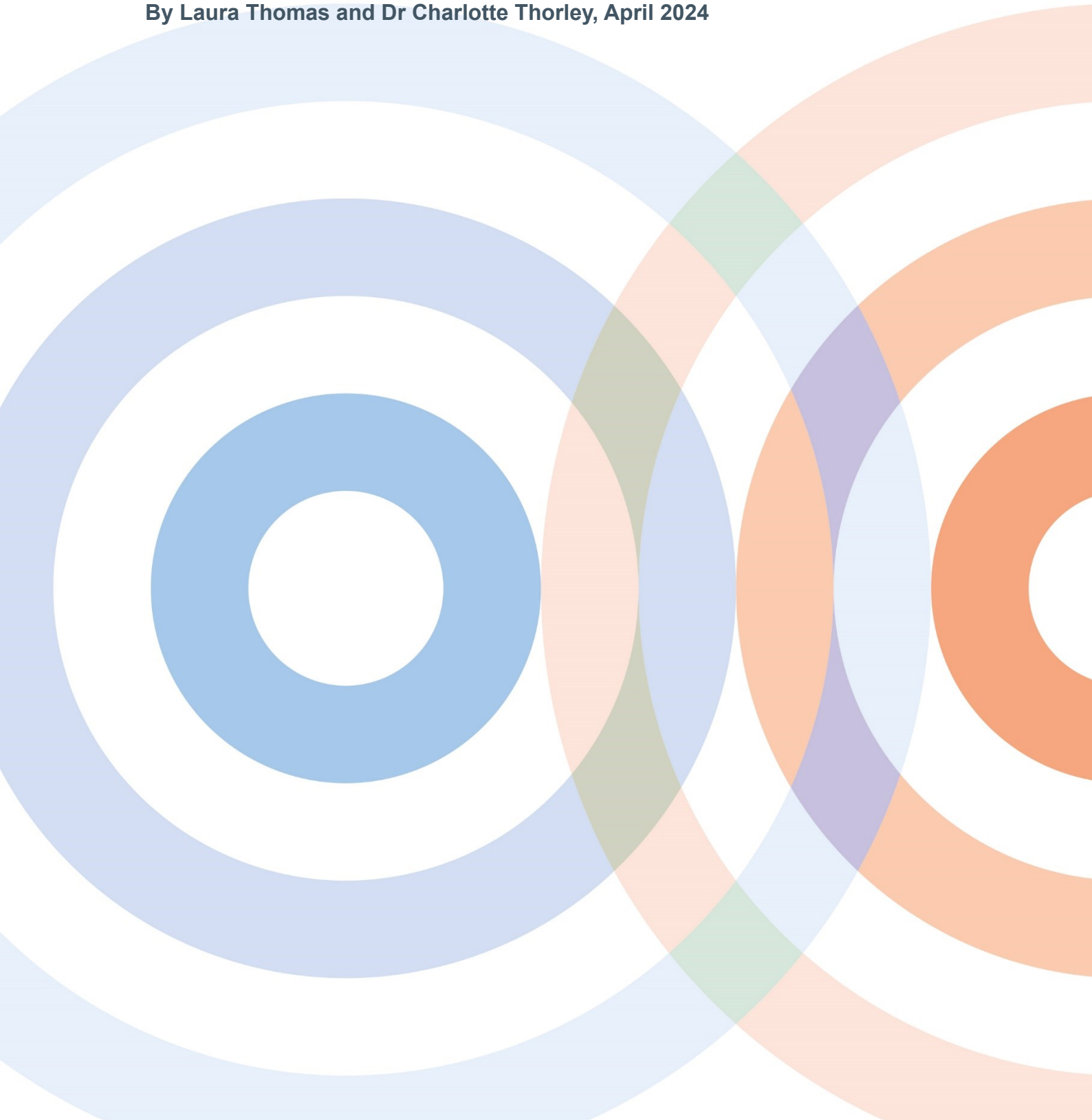Ondata Research

Impact Report:
Royal Society of Chemistry's Outreach Fund (2020-2022)

By Laura Thomas and Dr Charlotte Thorley, April 2024

Executive Summary

This report analyses the impact of the Royal Society of Chemistry's Outreach Fund through a review of 162 projects awarded and completed between 2020 and 2022. The Outreach Fund aims to enhance the science communication skills of chemists, engage with school students and public audiences, and provide chemistry engagement opportunities to under-represented communities.

Applicants to the Outreach Fund include individuals and organisations from diverse sectors. The report categorises grant recipients into community charities, cultural organisations, science centres/STEM engagement providers, education charities/social enterprises, universities, and schools. The maximum grant of £10,000 offered by the Outreach Fund is among the largest in the UK, indicating its significance in promoting chemistry engagement and outreach activities. Incentivising chemistry inclusion in outreach programmes in this way fills a crucial gap.

The research used a Mixed Methods approach, combining quantitative and qualitative data, reviewing documentary evidence from the projects and interviews with grant holders.

The report presents the following key findings:

1. The Outreach Fund facilitates personal and professional development opportunities for chemists.
2. Projects inspire and raise aspirations among diverse audience groups.
3. Project topics help individuals relate chemistry to their lives, emphasising its relevance.
4. Grant holders effectively engage under-represented audiences within chemistry.
5. Projects foster new partnerships and collaborations, enhancing networking opportunities.
6. Funding from the Outreach Fund enhances the quality and professionalism of projects.
7. Projects leave lasting legacies, impacting individual attitudes and organisational strategies.

It was observed that a significant portion of projects target school audiences, aiming to increase participation in chemistry qualifications and encourage careers in chemistry. These curriculum-linked projects often involve partnerships between schools and universities, encouraging students to connect classroom experiences with real-world research. Having said that, the breadth of audience targeted by the funded projects was large, as was the range of intended impacts. Through this activity the Outreach Fund influences the wider STEM engagement sector positively, improving practices and fostering networking.

Some areas showed potential for further development. Whilst chemists involved in outreach projects experienced a range of professional development opportunities, this was not easy for the projects to conceptualise or report on. Another ripe area for recognition is that of the additional funding and resources leveraged by the Outreach Fund; in-kind and match-funding again was not fully articulated by grant holders but was widespread.

Overall, the report highlights the positive impact of the Outreach Fund in advancing chemistry engagement, fostering partnerships, and inspiring diverse audiences across the UK.

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About the Authors

Laura Thomas and Charlotte Thorley both have significant experience supporting organisations such as learned societies, charities, universities and science centres in gaining an in-depth understanding of the impact of their programmes. Charlotte and Laura have direct experience of working with researchers and community groups on outreach and public engagement and as part of university public engagement senior leadership. They have first-hand experience of running funding schemes as well as applying for outreach funding, and particularly within the physical sciences. As consultants they have had ongoing experience with school outreach and public engagement as both practitioners and evaluators. In addition to this, they are experienced social sciences researchers: Charlotte holds an EdD from the Institute of Education where her research was concerned with the attitudes of physics researchers to outreach and Laura is undertaking a part-time PhD in Educational Research at the University of Stirling with her study focussing on the professional learning experiences of physics teachers.

The Royal Society of Chemistry

By Charlotte Lester, Programme Manager for public engagement and outreach at the Royal Society of Chemistry

The Royal Society of Chemistry (RSC) is one of the oldest chemical science societies in the world, with roots dating back to 1841. The RSC published its most recent 5 year strategy in 2021 addressing five pillars organisation, publishing, education, voice and influence and membership which is underpinned by an inclusion and diversity strategic framework and cross cutting commitments to sustainability. The societies membership, includes scientists, researchers, innovators, educators, students, chemistry using professionals and individuals with an interest in chemistry. The RSC works with and provides services to its members supporting the scientific and industrial communities, working with local sections, leading on professional practice and standards, influencing policy and sector culture, disseminating knowledge and supporting chemistry education.

The RSC also plays a crucial role in promoting the understanding and application of chemistry to scientific, societal and policy challenges working with universities, research institutes, industries, and government bodies. It works to promote public awareness and understanding, one of the approaches taken is public engagement and outreach which actively supports the delivery of RSCs strategy through funding, communications campaigns, education programmes and the member volunteers. This report examines one mechanism which supports engagement and outreach, the distribution of investment to support chemistry-related projects through the Outreach Fund.

1. Introduction
1.1 Royal Society of Chemistry Outreach Fund

This report examines the impact of the Royal Society of Chemistry's Outreach Fund focussing on 162 awards made in 2020, 2021 and 2022. The aims of the Outreach Fund are to:

A. Develop the science communication skills of chemists – building capacity and opportunities for chemists and chemical scientists to engage with schools and public audiences

B. Engage with school students – inspiring and raising aspirations of student audiences to nurture a future generation passionate about the chemical sciences

C. Engage with public audiences – involving a wide range of people in relevant contemporary issues in the chemical sciences

D. Provide under-represented audiences, communities and places with inspiring chemistry engagement opportunities, delivered or coordinated by skilled people.

The applicants to the Outreach Fund are a mixture of individuals and organisations representing a diverse range of sectors. There is representation from academia and industry, education (primary and secondary schools) and the third sector (including arts and community organisations and charities). The motivations and benefits for undertaking public engagement and outreach are multiple and the RSC has undertaken its own studies and supported research projects examining public attitudes (TNS BMRB 2015) and the impact of outreach on school pupils (Mujtaba, Sheldrake & Reiss, 2020). The following section describes the grant holders in more detail before the STEM public engagement and outreach funding landscape is discussed.

1.2 The awards made by the Outreach Fund

During the period under 2020-2022 review 162 awards were made and completed forming the sample for this review. Each organisation was allocated by us to one of the categories listed below based on information provided as part of their application or evaluation form or using publicly available information.

- Community charities: focussed on engaging groups of people in local communities. These would commonly target working with a specific audience group, such as young people or those who have a physical disability. These organisations do not typically have a STEM-focus as part of their aims but do participate in STEM-related activities.
- Cultural organisations: these organisations encompass a range of creative areas, including music and performance companies and venues along with museums. As the

previous category, these organisations do not have a specific STEM focus but do involve themselves as partners.

- Science centre/STEM engagement providers: those included in this category have a strong STEM focus in their dedicated visitor venue or as part of their organisational mission. Not all of these organisations have a dedicated venue (e.g. science centre) and they will all deliver activities in a range of settings.

- Education charity/social enterprises: in this instance these organisations have specialist expertise and focus on delivering against a clear mission. This mission often relates to engaging those groups who are traditionally under-represented in STEM. Some of these have STEM expertise in-house but not all. What they have in common is that they are able to use chemistry as a basis for working with their established networks but may need to bring in chemistry expertise. These organisations range in size.

- Universities: traditional and modern universities are represented within this group, covering all four nations of the UK and also the Republic of Ireland.

- Schools: a mixture of primary and secondary schools make up this grouping. Unfortunately it's not possible to give an exact breakdown as to primary versus secondary schools based on the information available. The group was made up of two independent schools and the remainder are state schools or received government funding. For some in England, they were part of a multi-academy trust.

Figure 1 shows the split of the awards to these organisations. Given the broader STEM engagement landscape, it is unsurprising that universities were in receipt of the most grants.

Figure 1. Proportion of grants awarded by organisation type
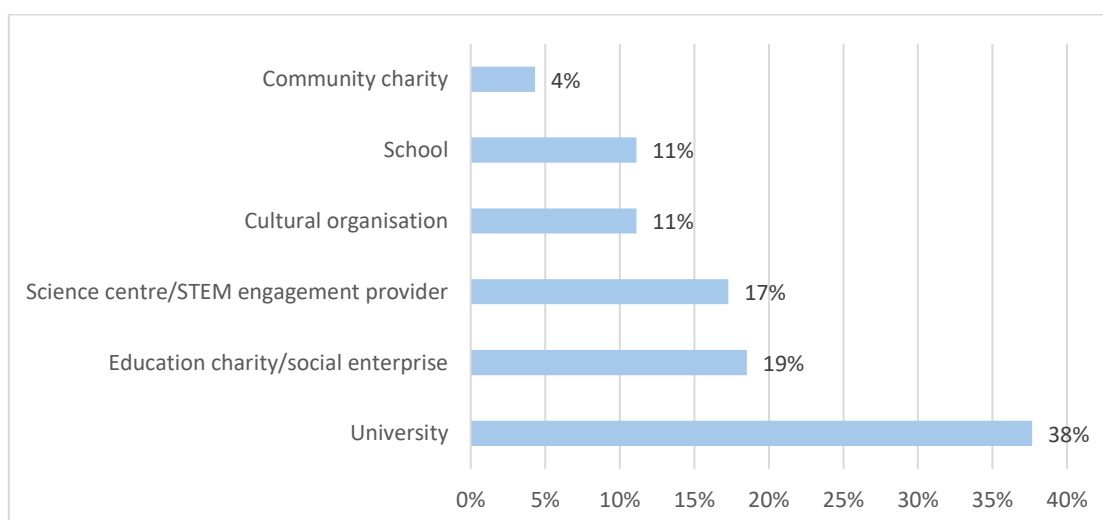
Figure 2 and Table 1 show the distribution of the grant awards across the UK and the Republic of Ireland. The location was provided to the RSC as part of the application form and is linked to where the organisation is based. There is limited information available on where the audience groups are located and some projects, especially those working online, have indicated their audience is UK-wide. London has been split out from the rest of England due to the population size. In terms of the spread of awards across the UK and Republic of Ireland, there is correlation between levels of population and the volume of awards in each nation, with slightly lower than expected levels in Northern Ireland and the Republic of Ireland.

Figure 2. Geographical spread of grant awards
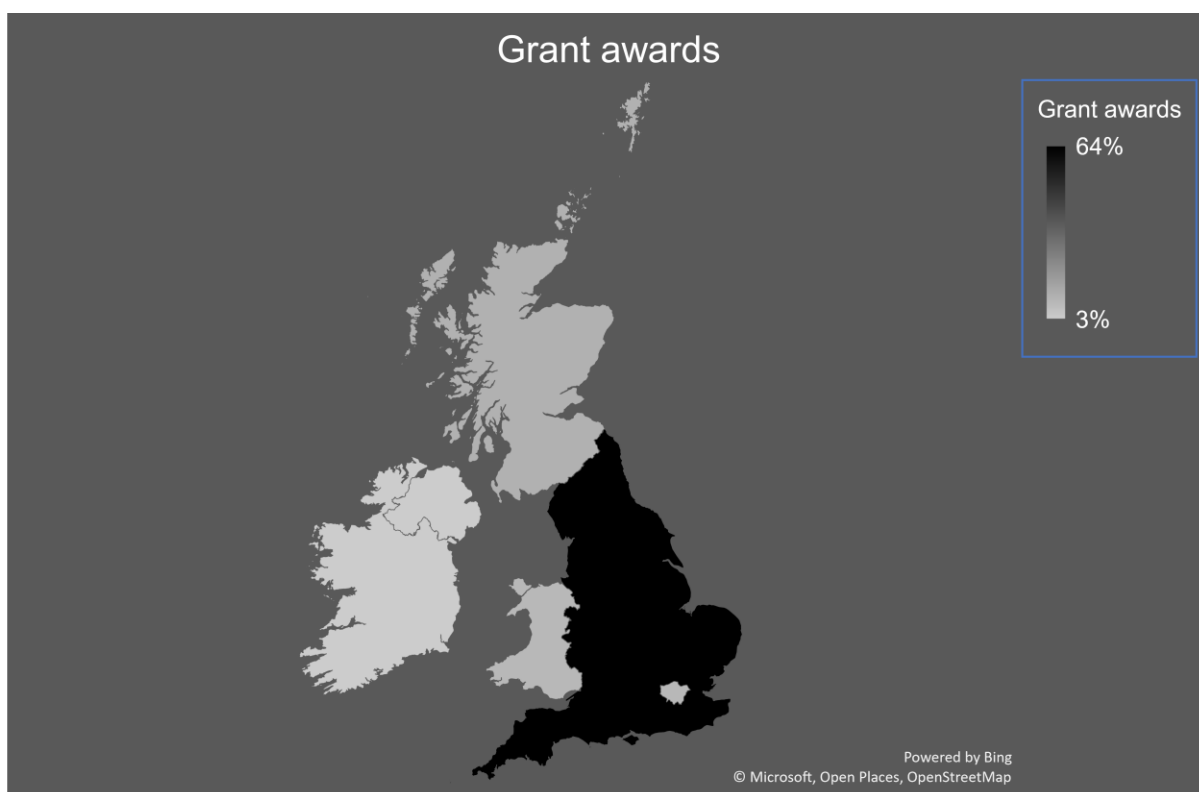
Table 1. Geographical spread of grant awards by number and proportion

Nation/City	Number of awards	Proportion of awards
England	97	64%
Scotland	17	11%
Wales	14	9%
London	14	9%
Northern Ireland	5	3%
Republic of Ireland	5	3%
	152*	

*Please note that there was the option for projects to select 'online' when asked about location and therefore these were not included in these totals.

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Looking at the data for English regions in Table 2, there is again a reasonable distribution across the different areas and London does not dominate. However, when comparisons are made between the north and south of England along with the east and west, there is a skew in terms of allocation of awards in the south of England and the west of England. The RSC may wish to consider whether there are any particular drivers that account for this distribution.

Table 2. Geographical distribution of grant awards in England

English regions[1]	Number of awards	Proportion of awards
West Midlands	25	23%
South East England	22	20%
South West England	14	13%
London	14	13%
North West England	12	11%
North East England	11	10%
East	7	6%
Yorkshire and the Humber	6	5%
	111	

The British Science Association (BSA) has undertaken an engagement mapping exercise in order to better understand the geographical spread of opportunities across the UK and to identify areas where there are gaps in provision (London Economics 2022). This resulted in a report and map to help identify where there are gaps in provision based around local authorities. Unfortunately it is not possible to directly map the work being done by the RSC grant holders against the information provided by the BSA. Some of the grant holders report their activity as being "nationwide" and specifics on the location of the audience groups by local authority aren't detailed in the information provided to the RSC. For the period of funding under review, the lockdowns due to COVID-19 also impacted on the mode of delivery which saw many move online and reach a broader geographical area than they would have if the project had proceeded in person and again, the specific details are not available. The following ten local authorities have been identified by the BSA study as having the least opportunities for science engagement:

- Doncaster
- East Riding, Yorkshire
- Teignbridge
- Sedgemoor
- South Somerset
- Dumfries & Galloway
- West Suffolk
- Dorset

[1] The regions refer to those specified in the International Territorial Levels, specifically ITL 1 descriptions (ONS 2024)

- East Lindsey
- Shropshire.

The Outreach Fund has funded projects in Doncaster, East Riding (Yorkshire) and Somerset but it's difficult to identify the size of the audience reached as these projects have worked across more than one local authority. There are likely to be more grant holders which have reached audience groups in these areas but it is not possible to identify who they are as this level of information is not available in current reporting.

We now review the mode of engagement and details of the audience groups engaged.

Mode of engagement and audience groups

As part of the applications process and the reporting at the end of the funding period, grant holders are asked to provide information on the audience groups they are engaging with and how many fall within these groups. A significant amount of data cleaning was undertaken in relation to the audience categories, mode of engagement and numbers of engagements for the grant holders as in many cases numerical data was not provided in an individual entry and was instead supplied as part of a narrative response. The funded projects reported a mixture of numbers of people engaged with in-person and online (e.g. via website visits or social media impressions) totalling over **1.9 million engagements**.

The different modes of engagement are described more fully below. Projects have been categorised so that their engagements appear in one mode. See Table 3 for full details. The dominance of the online engagements is likely a feature of the period of funding under review as it encompassed the COVID-19 lockdowns.

Many of the projects used multiple online modes of engagement within their project. All modes of engagement are described below.

- Remote learning: where there has been a combination of a physical resource, e.g. an experimental kit, supported by an online resource such as a video.
- Digital resource: where projects have made a worksheets or a toolkit available online to download.
- Online engagement – website: This is where the project has reported the numbers visiting their project website based on Google Analytics or numbers from the hosting platform. Several of the projects did not describe whether they were reporting unique visitors or page impressions.
- Mixture of in-person and online engagement: these projects engaged with people in person and via online events or discussions. This doesn't necessarily mean the same

audiences were engaged online and in-person. For some projects they were offering different ways in which to engage with events.

- In-person engagement: where projects were able to engage with their audience groups face to face. Some projects conducted one-off sessions and others had a set of repeat engagements.

- Online engagement – video views: These projects typically used YouTube to share video content. A small number of projects indicated that they also counted video views from platforms such as Facebook. These video views were explicitly included in their reporting as the core activity for the project was to share video content.

- Online engagement – live events: these projects reported the size of the audiences engaging with live broadcasts of events online, e.g. through YouTube or other platforms.

- Online engagement – website and live events: these projects had a project website which was joined by live broadcasts of events.

- Online engagement – podcast downloads/listeners: these numbers were reported as being either live audience figures, depending on the type of broadcast, or downloads/listens to the programme.

- Online engagement – website and social media: these projects focussed on having a digital presence based on a dedicated website which was then promoted via social media or there were discussion based activities or images shared via social media that formed the basis of the project engagement. The scale of engagement in this category is large and include the following types of data:
  - Website analytics, e.g. unique visitors, page impressions.
  - Social media: post impressions and engagements (organic and paid), number of followers.

  Please note that there was no consistency between projects in terms of the numbers being reported. E.g. some focussed on post impressions (which could be viewed multiple times by one account), whilst others would focus on the number of unique accounts reached.

Levels of digitally-based engagements (Table 3 outlines the levels of engagement) are consistent with the increased use of online methods in wider society due to the COVID-19 pandemic. For projects utilising digital engagement methods, those registering the highest number of engagements are those using social media and podcasts.

Table 3. Summarising the difference modes of engagement

Mode of engagement	N of engagements	N of projects	% of projects
Online engagement - website and social media	1032825	8	4.9%
Online engagement - podcast downloads/listeners	517207	8	4.9%
Online engagement - website and live events	118300	2	1.2%
Online engagement - live event	92085	16	9.9%
Online engagement - video views	71226	8	4.9%
In-person engagement	52369	78	48.1%
Mixture of online and in-person engagement	49305	13	8.0%
Online engagement - website	29417	7	4.3%
Remote learning (physical kit provided alongside online support, e.g. videos)	14054	16	9.9%
Digital resource	11945	6	3.7%
Total	1,988,733	162	

In addition to the engagement type we have also examined the information provided on the audiences being engaged. As can be seen from Figure 3 many of the projects engage multiple and mixed audience groups. This Figure also shows how the audience groups make up the total number of engagements. Different audience groupings were available to grant holders at the applications and evaluation stage. The following groupings are based on those supplied to grant holders at the applications stage.

Figure 3. Types of audience groups reached by grant holders
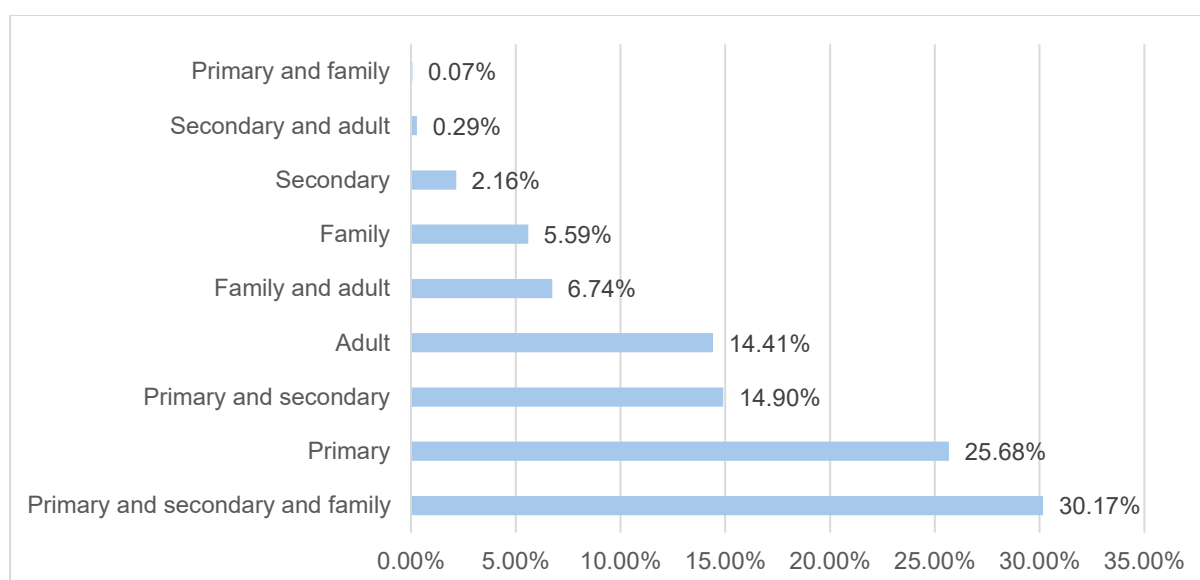
A further allocation of these different audiences has been made in order to more easily see the split of projects who have engaged a school-based audience versus adult and family groups, with nearly three quarters identifying a schools-related audience as their target group.

Figure 4. Proportion of engagements by audience categories
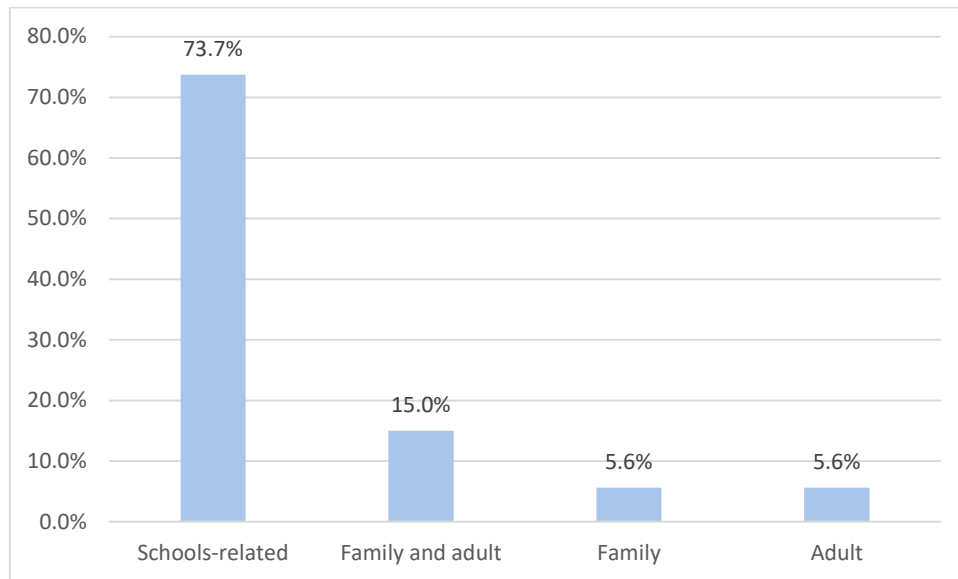
Despite the inference of Figure 4, the majority of projects aren't necessarily engaging with schools as their audience. For example, some of those interviewed talked about engaging a school-aged audience but outside of the school environment. Based on the information available from the applications and evaluation data we were not able to break down the schools-related audience grouping further. The data requested from applicants could be simplified and this is discussed further in the methodology section and recommendations on this aspect are made in Appendix A.

During the period under review, funding for the Outreach Fund came from two sources:

1. Royal Society of Chemistry Core Funds.
2. Chemists' Community Fund.

We are grateful to Charlotte Lester, Programme Manager for public engagement and outreach at the Royal Society of Chemistry for providing us with the following description of the Chemists' Community Fund and for her review of and comment on the organisations the fund has engaged with.

> The Chemists' Community Fund (CCF) is the working name of the RSC benevolent fund. It is a linked charity to the RSC with its own charitable objectives. The CCF's primary charitable purpose is the relief and prevention of poverty for members or past members of the RSC, as well as support for their partners, children, and other dependents. Where funds are not required to fulfil this primary object, support can be used for other charitable purposes, under its secondary object. The RSC's Trustees have agreed guiding principles for this secondary purpose, which includes support for individuals in the wider chemistry community, providing equality of opportunity and early intervention and support. Specifically relevant for outreach, Trustees agreed this can include extra-curricular enrichment in chemistry, and support for under-served and economically disadvantaged students.
>
> In September 2020, the CCF Secondary Object Working Group (a group of Trustees) approved a proposal for £100k to be made available from the CCF to provide ring-fenced additional support to the Outreach Fund, for initiatives that closely align to the CCF's guiding principles, as part of the Outreach Fund 2021 funding rounds. Projects that were awarded funding via this route were required to meet additional qualifying criteria:
>
> A.   Programmes are directly reaching priority groups as they are highly targeted (e.g. youth groups, support groups for young carers or disabled people, children in Special Educational Needs and Disabilities (SEND) schools, schools in deprived areas and/or high proportion of Black, Asian and Minority Ethnic (BAME students);
>
> B.   Programmes that focus on the outcome and positive impact on those individuals (e.g. through providing multiple touch-points, with defined aims to support immediate needs, or their future careers);

C.   Programmes where the budget is directly aimed at enabling delivery (rather than solely supporting the planning and development phase).

Prioritisation included initiatives that might rely on external funding to take place, and considered the uncertainty in the funding environment at that time.

Following a report of 2021 initiatives, a subsequent funding request was made to the CCF Committee to provide £375,000 between 2022-2024 (3 years) to continue this ringfenced support under the same criteria. This approach supported the allocation of funds to meet the CCF charitable purposes, in a way that was scalable to deliver with no additional operational spend.

To qualify for CCF support, initiatives needed to first meet the core criteria of the Outreach Fund. Projects meeting the additional CCF criteria were not excluded from qualifying for wider RSC funds should CCF funds be exhausted.

CCF Supported Grants

In the period under review of the projects that were started and completed in the timeframe, 13% (21 grants) were supported via CCF funds. The grants supported activity across the full range of organisations funded by the Outreach Fund. Organisations including community charities and social enterprises, that the RSC is less likely to have direct relationships with through other channels received a significant level of support receiving 67% of the awards (n=14/21). Universities were also a significant recipient of CCF supported grants receiving 33% of the awards (n=7/21).

Host organisations were based across the UK with projects in each of the devolved nations, and wide geographic spread across England, with the largest number in the Midlands and the smallest in the east, southeast and northwest. As required by the additional fund criteria projects were targeted at specific groups who face higher barriers to entry and engagement with the chemical sciences. Projects engaged a variety of audiences. The most frequently targeted audiences were young people from low socio-economic groups and lower higher education participation regions, young people with special educational needs and young people in areas of high deprivation.

Support for under-represented audiences was a key aspect of CCF support and is explored in further detail in section 3.4. Following this overview of CCF support we now go on to consider the general funding landscape for STEM public engagement and outreach.

1.3 Public Engagement and Outreach Funding

The RSC Outreach Fund sits within a larger public engagement and outreach landscape in terms of practice and funding. This section reviews the different opportunities available to organisations, the aims of these grant funds, the scale of funding available and the impact of other grant schemes. Summary findings are presented here with more detailed descriptions of the 21 funds reviewed available in Appendix C relating to the size and scope of the outreach and public engagement funding and the aims of the schemes.

Funding eligibility

The availability of funding and eligibility for public engagement and outreach in the UK is often linked to specific factors concerning the applicant's profession or organisation (e.g. whether they are a university-based researcher) or are related to the focus of the project (e.g. funding is for work in a specific subject area or with a defined audience group). The organisations making applications for funding have their own engagement strategy. In terms of general categories, the funding schemes reviewed fall into the following groupings: academies (e.g. Royal Society), professional bodies (e.g. Institute of Physics), STEM-related charities (e.g. British Science Association) and subject-related associations (E.g. British Society for the History of Science).

In terms of eligibility, researchers in higher education have greater access to funding as they are often able to include public engagement and outreach activities as part of applications linked to their research (e.g. via specific national funding bodies such as the Science and Technologies Facilities Council) and there are defined "impact" funding schemes supporting specific translation of research (e.g. UKRI's Impact Accelerator awards (UKRI 2022)). For universities in England there are also opportunities for outreach funding coming via university budgets allocated to widening participation as this is a requirement of 'Access Agreements'.

For those in other sectors, for example industry, compulsory education and the third sector, there are a range of grant schemes available with many of them having a subject-specific link. However, there are often restrictions on schools applying directly for grants with some organisations having specific school-related funds (e.g. the Institute of Physics).

Funding aims

Within the group of outreach and public engagement grants funds which were reviewed, a set of recurring themes arose within the stated aims, although it should be noted that not all schemes linked to all of the following areas, some focused on one or two only. These were to:

- Raise awareness and improve public understanding of science.

- Inspire and enthuse audiences, encouraging curiosity about science topics and dialogue with researchers.

- Support the professional development of scientists and provide opportunities for engagement with the public.

- Raise aspirations and support young people in identifying potential career opportunities.

- Engage with under-represented audiences.

Scale of funding

The £10,000 maximum grant awarded by the RSC Outreach Fund is one of the largest available in the UK, with only the Royal Academy of Engineering offering a larger grant of £30,000. The Royal Society offers grants of £500 - £10,000 but has a cap of £5,000 spend per year for an award. The British Academy is piloting a new scheme and is offering an annual grant of £8,000. The most common annual limit for funding sits at £5,000 (6 schemes offer this as a maximum). Other common limits include £2000 (3 schemes), £1000 (4 schemes) and less than £1000 (2 schemes)[2]. There are no directly competing schemes and indeed, projects will sometimes hold more than one grant as they undertake larger scale interdisciplinary work. Therefore, the existence of the RSC's Outreach Fund ensures chemistry is well represented amongst the STEM engagement activities across the UK.

Impact of grant schemes

There is very limited information available from other schemes on the impact of their grant awards, although there is often detailed information about the number of grants funded and examples of the types of successful projects. The Ingenious Awards from the Royal Academy of Engineering have monitored the impact on engineers engaging with the scheme and reports:

> "Since 2010 we have tracked the long-term impact of Ingenious projects on the engineers who have taken part. Over 90% reported benefitting from participating in an Ingenious project, 67% had improved their communication skills and 37% gained new perspectives on their work. Other benefits include developing project management, budgeting and leadership skills." (RAEng 2023).

In addition to the short statement on impact from the Royal Academy of Engineering, a paper on the impact and operation of a small grant scheme (up to £500) run by The Institute of

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[2] Please note that the search for comparable schemes was limited to other professional bodies and those with a subject-specific focus.

Classical Studies discussed the operational challenges and the types of opportunities the grants seeded (Bridges 2021). However, this scheme is very different in its aims to the RSC Outreach Fund. In addition to the wider public engagement and outreach funding landscape there are a range of relevant activities and strategy within the RSC itself and the following section examines some of the key links and connections we have identified.

1.4 Connecting to Royal Society of Chemistry research and strategy

Here we aim to highlight the many ways in which the Outreach Fund contributes to and builds on previous RSC studies and current strategy.

Public Attitudes to Chemistry:

There are a range of findings from the Public Attitudes to Chemistry study (TNS BMRB 2015) relevant to the Outreach Fund. As part of this study, opportunities for science communicators and those working with the public were identified. The key areas relevant to the Outreach Fund grant holders were that the public attitude towards chemistry tended to be "distant from the individual, and not applied to the 'real world'" and that science communicators needed to "'go where people are', recognising that self-selecting audiences to chemistry events will not be reflective of the general public". Outreach Fund grant holders have successfully engaged the public with topics which are relevant to them with a broad range of areas having been explored. There has also been significant partnership working and community-based activity with the result that the grant holders have been able to reach new audiences.

Chemistry for All:

The Chemistry for All study (Mujtaba, Sheldrake & Reiss, 2020) examined the impact of a set of additional chemistry activities and events for a group of 17 schools in England. The report discusses a number of aspects, including the attitudes of pupils to chemistry. It also identifies various aspects of best practice for different stakeholders such as funders and the Outreach Fund does adhere to the identified practices. For example, the Outreach Fund helps to "Ensure a diversity of people (including across age, ethnicity, gender and other aspects of people's identities, characteristics, and circumstances) are portrayed as contributing to chemistry and working in it and with it." This has been achieved by projects working with under-represented audiences and those where the stories and experiences of a diverse range of role models have been featured and explored.

Inclusion and Diversity strategy:

The Outreach Fund is delivering on aspects relating to the Inclusion and Diversity strategy (Royal Society of Chemistry 2023). Relevant areas within the strategy are 'inclusive

progression' and 'inclusive access'. In these two areas, the Outreach Fund projects are highlighting the opportunities available and there has been an effort to diversify the role models being used along with significant efforts to reach underrepresented groups.

Campaigns:

In addition to the research and strategy discussed above, there are also a set of campaigns guiding RSC work. These include:

- Chemical waste and pollution
- Discovery, research and innovation
- Chemistry education
- Environmental sustainability
- Inclusion and diversity in the chemical sciences

Outreach Fund projects funded so far could be considered to contribute to each of these areas, in particular those of inclusion and diversity as mentioned above, and chemistry education. A number directly address environmental sustainability, something which could be done more with in future rounds. There are projects which could be considered to address chemical waste and pollution, and discovery, research and innovation, although it is not clear from the information available on the projects to what extent core messages of these align with the precise messaging of the campaigns.

1.5 Relevant theoretical frameworks

To complete this context setting section it is prudent to consider the framing of public engagement and outreach within the UK more generally. In addition to those key reports mentioned in section 1.4, and funding schemes mentioned in 1.3, there are also various frameworks emerging to assess the quality and value of engagement activity. Those key to the RSC Outreach Fund are described below.

Science Capital (Archer, Dawson, DeWitt, Seakins, & Wong, 2015) refers to the cultural resources, knowledge, attitudes, and experiences that an individual possesses related to science. It encompasses a person's understanding of science, their engagement with scientific activities, and the value they place on scientific knowledge, all factors which influence a person's interest and participation in science. Science capital and the Science Capital Teaching Approach (Godec, King & Archer 2017) are often used to inform the development and to understand the outcomes of outreach activities, particularly for those working with young people, and is increasingly used in the museums and science centres sector.

Public engagement with research (PER) refers to the process of involving and interacting with the public in the various stages of research, from its design and execution to the dissemination of results. This engagement aims to create a two-way dialogue between

researchers and the public, fostering mutual understanding, collaboration, and the integration of diverse perspectives. National investment in PER over the last 15 years in particular has provided a contextual structure and rationale for most university and research institutions to embrace their staff participating in outreach and engagement.

Research impact refers to the tangible and intangible effects or outcomes that result from research activities. It assesses the influence that research has on various aspects, including academia, society, policy, industry, and the economy. In the UK, the research excellence framework (REF) assesses the quality and impact of research generated by qualifying higher education providers. The REF is delivered by Research England (UKRI) on behalf of the UK funding bodies: Research England (UKRI), the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW), and the Department for the Economy in Northern Ireland. Outreach and engagement projects are eligible routes to impact and are often particularly valuable to those academics working in highly abstract or theoretical disciplines.

Equity/Equality, Diversity and Inclusion (EDI) refers to creating environments that embrace diversity and actively involve individuals from various backgrounds, regardless of their gender, race, ethnicity, socioeconomic status, disability, or other characteristics. The goal of inclusion in STEM is to ensure that everyone, regardless of their identity or background, has equal opportunities to participate, contribute to, and succeed in STEM education, research, and careers. The RSC has strategic aims with respect to opening chemistry up to under-represented groups, but the Outreach Fund is not limited to work solely with those groups. How EDI is implemented by each grant holder will vary with respect to their locale, strategic aims, and purpose.

Having described the scene within which this study is set, the following chapter outlines our approach to reviewing the Outreach Fund.

2. Approach

2.1 Scope

This report seeks to consider and assess whether the Outreach Fund is meeting its articulated aims (see section 1.1). In order to assess this, the RSC outlined the following priority questions for the research

1. Quantifying the reach of the programme. E.g. what types of organisations were funded and what audiences did they engage with? *(Section 1.2).*
2. Establishing the extent to which the Outreach Fund is achieving its aims *(Section 3).*
3. Commenting on the fund's strengths and weaknesses from an internal and external perspective *(Section 3).*
4. Gaining an understanding of the experiences of grant holders from pre-application to post-project legacies *(Section 3)*.
5. Recommending ways in which the programme can do more to meet its aims and objectives *(Throughout section 3 and summarised in section 4)*.

2.2 Sample

The period under review runs from 2020 until 2022 covering 162 different projects that were funded and completed during this time. These encompassed 45 large awards (£5,001 - £10,000) and 117 small awards (up to £5,000). The geographical distribution and audience engagement have been summarised in section 1.2. The selection process for identifying grant holders for interview is described more fully in the following method section.

2.3 Method

This section summarises the study method and describes the steps taken to address the different areas of interest within the research. Overall our approach used Mixed Methods with an equal consideration of quantitative and qualitative information. By using a mixture of data, multiple views can be considered and this can increase the "usefulness and credibility of the results found" and can allow for unexpected results to be found (Cohen, Manion and Morrison 2018). In addition to the data provided by the RSC we interviewed a number of grant holders in order to generate greater insight into their experiences.

The methods were designed to examine the extent to which the Outreach Fund achieved its aims, what the programme's strengths and weaknesses were and to gain an understanding of the experiences of grant holders. In order to guide these three key areas, an evaluation framework was developed which was used throughout as a guide to data collection and analysis. Conversations with RSC colleagues helped to shape the evaluation framework,

outlined in Table 4. The main themes identified link to the Outreach Fund's aims and the evidence emerged from our assessment of the aims, informed by our own experience and knowledge and supplemented by discussions with RSC colleagues.

Table 4. Evaluation framework describing themes, evidence and data

Theme	Evidence	Data available
Impact on professional development of chemists	• Increased confidence of chemists. • Development of science communication skills of chemists. • Positive or improved attitude towards engagement for individual chemists. • Establishment of longer term collaboration between chemist and project partners.	• Applications, post-project feedback and evaluation reports. • Reflections from chemists (dependent on the content of the evaluation report). • Interviews with grant holders.
Inspiring and raising aspirations of school students	• Increased science capital. • Increased awareness of chemistry-related careers. • Increased understanding of chemistry-related topics. • Improved knowledge and skills. • More positive attitude towards chemistry. • Increased understanding of the relevance of chemistry to their own lives.	• Applications, post-project feedback and evaluation reports. • Interviews with grant holders.
Involving public audiences	• Diverse ways in which public audiences have been engaged in chemistry-related activities. • Involving a wide range of people in relevant contemporary issues in the chemical sciences. • Improved attitude towards chemistry. • Increased awareness of chemistry. • Increased understanding of the relevance of chemistry to their own lives.	• Applications, post-project feedback and evaluation reports. • Interviews with grant holders.
Position of RSC as an influential organisation with respect to outreach	• Positive attitude of applicants towards RSC. • Successfully meeting Outreach Fund's aims and objectives. • Establishment of longer term collaboration between chemist and project partners.	• Applications, post-project feedback and evaluation reports. • Interviews with grant holders. • Interviews with RSC staff.
Experience of the grant scheme	• Positive attitude of applicants towards RSC. • Repeated application. • Positive experience of the grant fund.	• Applications, post-project feedback and evaluation reports. • Interviews with grant holders. • Interviews with RSC staff.

In order to quantify the reach of the programme, and to inform the interview selections process, an analysis of the application and evaluation data was undertaken. The Royal Society of Chemistry collects a range of information as part of the applications process and at the conclusion of the project. A list of available data and information has been mapped into a third column of Table 4 above.

The data and information sources made available included copies of application forms, post-project feedback and any supplementary information such as evaluation reports. Not every project had a separate evaluation report and these submissions were of varying length, using a mixture of methods and were generally authored by the project team with a small number produced by external evaluators. A set of descriptive statistics were used to summarise the awards made by the fund capturing size of grant, location of organisation, audience type and reach. A number of recommendations have been made in relation to data collection at application and post-project phase to simplify and strengthen the data being collected. These can be found in Appendix A but in summary these describe a number of closed questions to ask grant holders which allow for easier collation and comparison across the projects.

The semi-structured interviews explored the grant holder's experiences of the project, why they applied, the role of chemistry and chemists within the project and the audience they worked with and their assessment of the impact. The interview schedule can be found in Appendix A. The following criteria were used to identify those for interview and there was also an intention to ensure geographical spread across the sample:

- Aim for minimum of 10 projects who are working with under-represented audiences.
- Roughly 14 interviewees with small grant holders.
- 50:50 split across school and public engagement grants.
- Within the schools: half primary, half secondary.
- Ensure at least two interviews with grant holders who have worked with a policy/government audience.
- Large award grant holders to make up 25-30% of interviews.

Those approached for interview were also split fairly evenly across 2020-2022. The RSC wrote to identified grant holders on our behalf to invite them for interview. Informed consent was sought from interviewees and they had the opportunity to withdraw this consent following the interview in line with good practice. All work conformed to BERA's code of ethics (BERA 2018) and data storage being compliant with GDPR. They could book an appointment directly with evaluators and there was a very high response rate: ultimately 40 projects were identified and 18 interviews were completed with project teams. This in and of itself is a significant indicator to us of the high regard and position of influence held by the RSC with these organisations.

Detailed case studies have been prepared based on selected interviews and pseudonyms have been used to provide anonymity for the individuals taking part.

2.4 Data Analysis

With regards to data analysis, Laura led on the documentary evidence and Charlotte led on the interviews. Reflexive thematic analysis (Braun and Clarke 2019) was then used by both Laura and Charlotte as the findings from both sets of evidence were combined. Table 5 summarises the codes used against the identified themes from the evaluation framework (Table 4).

Table 5. Themes and codes used for analysis

Theme	Codes
Impact on professional development of chemists	• Positive contribution of chemists • Professional development for chemists
Inspiring and raising aspirations of school students Involving public audiences	• Raising aspirations • Inspiring the audience • Skills and knowledge development • Improved attitude towards chemistry • Increased awareness of chemistry • Increased understanding of the relevance of chemistry to their own lives • Exposure to relatable/relevant chemistry topics • **Legacy** • Longer-term impact • Unexpected outcomes
Position of RSC as influential organisation with respect to outreach	• **Legacy** • Positive attitude towards RSC • **Leveraging additional resources**
Experience of the grant scheme	• Support from RSC • Positive influence of RSC • Positive experience of grant scheme • Negative experience of grant scheme • Impact of COVID • **Flexibility of grant scheme**

The initial codes were developed from the evaluation framework. The list was expanded as the evidence review progressed to capture legacy, flexibility of the grant scheme and the way in which holding a grant allowed for other funding and resource to be leveraged (highlighted in bold in Table 5).

As evaluators with experience across the UK STEM engagement and outreach landscape we were keen to examine where the Outreach Fund sits within the wider funding environment . This involved desktop research where other funding schemes were identified and information on each was collated. These other schemes were identified through web searches using key

words (public engagement grant, outreach funding, etc.) and through online lists of funding awards maintained by organisations such as the National Co-ordinating Centre for Public Engagement (NCCPE 2024). Full details of the schemes, including the scope of their funding and their aims can be found in Appendix C.

All of this analysis has been combined to make an assessment of the reach of the programme, its impact and the experiences of grant holders. The following section discusses the key themes arising within the analysis and makes recommendations. At the end of the analysis section are our own reflections and commentary in order to add to the assessment of strengths and weaknesses.

3. Analysis: Discussion of Outreach Fund Impact

The Royal Society of Chemistry Outreach Fund delivers significant impact and reach through its funded portfolio of projects. This section summarises the evidence available arising from the analysis of the documentation, the interviews and supporting case studies

Key findings

1. The Outreach Fund has provided opportunities for chemists to undertake personal and professional development.
2. The projects have inspired and raised aspirations of many different audience groups.
3. The project topics have helped people to make connections between chemistry and their own lives and as a result are better able to see the relevance and importance of chemistry to them.
4. Grant holders have worked with diverse audiences, reaching those who are under-represented within chemistry.
5. Projects have been the catalyst for developing new partnerships and collaborations or solidifying existing relationships.
6. The funding has increased the quality and professionalism of the funded projects.
7. Projects can leave legacies beyond the funded period, ranging from impacts on individual attitudes and practice through to influences on organisational strategy.

Experiences of grant holders

In terms of their experience of the applications process and the support provided to the grant holders after the award was made, the feedback was overwhelmingly positive. One key enabling factor has been the flexibility provided to grant holders when amendments to projects were necessary.

> *"You all seem a great organisation not only for what you're trying to do but also how you're going about achieving it, and I wouldn't hesitate to tell someone to apply to you for funding. I wouldn't describe myself as someone who was particularly interested in Chemistry before this project, but I really enjoyed working on it and I think our mix of collaborators meant an innovative product was the result."* (Grant holder feedback)

Overall, the interviewees also described the application process very positively, particularly in comparison to other funding processes they had experienced. There was some confusion about the amounts available, who was eligible for each level of grant, and why larger amounts were not ever made available. Funding for direct staff time was also mentioned as a desirable addition, but we note that these costs became eligible during the period of review in response to emerging needs within the community. The areas for development raised by interviewees were largely operational with the overall feedback highlighted that participants saw the

Outreach Fund as an effective enabling fund, one that trusted their expertise and valued their time. Interviewees attributed their awareness of the scheme to a variety of sources, the most common being either that someone with a link to the RSC had sent on the details to them, in particular RSC members, or that details of the scheme had come up when searching for funding for their target audience. Whilst specifically searching for chemistry outreach funding was limited to those in academic chemistry roles, several mentioned looking for STEM funding and some suggested that the fund could usefully be promoted in arts funding lists.

It is worth noting that despite being explicitly asked about whether needing different amounts or durations for the funding, there was no consensus in the interview responses. Individual interviewees did mention desiring larger funds, however for several the existing size was an enabling factor. Similarly with respect to funding mechanisms; this scheme was considered favourably compared to other funding schemes available when looking at how long funds took to arrive and conditions that must be met for payment.

The following sections discuss each of the key findings in depth. Throughout each section we have also incorporated feedback from grant holders and we conclude sections with a short summary and associated recommendations. We begin with an examination of the role of the professional development of chemists through project participation.

3.1 Professional development for chemists

This section explores how the Outreach Fund delivers against its aim to "Develop science communication skills of chemists – building capacity and opportunities for chemists and chemical scientists to engage with schools and public audiences". We begin by discussing some ways in which professional development was experienced within the projects before outlining chemist personas, to support describing development journeys. The case study chosen for this section highlights the experiences of an early career researcher.

Experiences of professional development

There is significant evidence amongst the projects of the professional development experienced by chemists. **Over 80% (n=132) of the projects reported that they involved a chemist in the development and delivery of the project.** The following key aspects emerged from the analysis:

- The funded projects offered a range of opportunities for chemists to get involved in outreach and public engagement allowing them to share their passion for their subject.

- There are instances where the reputation and profile of the participating chemists was raised within their research community due to the outcomes of the project. In one instance this *"resulted in international collaborations and opportunities to leverage further funding"* (Grant holder post-project feedback).

- There were also several instances where there were creative partnerships between chemists and actors, musicians, artists, and poets, enabling grant holders to explore new delivery mechanisms and ways of partnership working.

- Projects have also provided important opportunities for skills development for chemists at all stages of their studies and career, including secondary, further, and higher education.
    - Many interviewees directly referenced seeing or experiencing improvement in chemists' communication skills and confidence speaking with different audiences.
    - Several interviewees who are chemists discussed indirectly the development of their ability to write grant applications, project manage, and work with partners.
    - All interviewees discussed in depth their conception of and ability to work with their target audiences, and to make chemistry interesting in a variety of ways. These were never discussed overtly in terms of skills development.

Interviews showed that the consideration of the professional development of participating chemists was core to some projects, yet missing for others. Many project leads, notably those who were hesitant to self-identify as a chemist, were unsure how they as individuals or through their work could contribute to the skills of a chemist, who they considered to be a more knowledgeable partner, or one to have more influence and power than them. Language used by interviewees indicated that this was a larger issue than with an individual project or project partner; rather the grant holder indicated feeling that the nominal "chemist" for the project had increased status and authority. This was in particular reported by grant holders based in community groups or smaller organisations.

Chemist personas

The nature of who the term "chemist" applied to was diverse, with projects leaning on outreach professionals with a chemistry interest and people in chemistry-related professions but who did not consider themselves to be chemists, as well as industrial and academic chemists at a variety of levels. This variation impacts on the types of and strength of impact the scheme has on the participating chemists, as they all starting from very different baselines, some improving their confidence to speak about chemistry, others refining communication and demonstration skills, or learning detailed teaching or engagement mechanisms. Table 6 shows an overview of some sample chemist persona journeys through participation in the Outreach Fund scheme with personas informed by the RSC and Cambridge Economics work on workforce trends and economic impact (RSC and Cambridge Economics 2020).

It should be noted that schoolteachers could follow any of the persona journeys depending on their background, teaching level and role.

Table 6. Chemist journeys through the outreach fund. As noted elsewhere, schoolteachers should be considered to move through any of these routes depending on their personal circumstances.

Persona Type	Description	Typical journey	Example evidence
Unbadged professional	Works in a role that uses or addresses chemistry everyday without it being badged as "chemistry". E.g. brewery worker, baker, make-up artist.	• Begins to understand the connections between their work and chemistry. • Starts to connect their work with areas of societal concern related to chemistry. **Begins to connect to the idea that they have skills or knowledge related to chemistry.**	*"we had a little conversation at the end with her saying, you know, the chemists use the word toxic, this is what it means. But when a women's magazine uses it, it's a totally different thing."*
Chemistry enthusiast	Works to enthuse others about chemistry without it being their specific background, but has picked up a lot of knowledge through self-learning.	• Reinforces their knowledge of fundamental and/or contemporary chemistry topics. • Anchors their work to that of peer reviewed or otherwise quality marked research. **Feels included in chemistry community**	*"some of my team are really good on [redacted] science, but most of us are kind of amateur enthusiasts. And as we kind of got excited about the science of [redacted], that made us feel that we were really well aligned with an organisation that gave funding for public engagement with science, because [if] we were [as] excited by it as the public then we thought that the wider public would be too"*
Professional chemist	Works as a chemist on a day to day basis in a role that requires chemistry specific skills and/or qualifications.	• Applies their knowledge and skills in a way that is enjoyable and rewarding. • Develops engaging ways to talk about their own work and relate it to wider issues. **Feels validated as a valuable part of chemistry community**	*"she said, it kind of brought her back that it was more fun …she said I got to talk about stuff I didn't talk about in years, and I could hear her really drilling into the detail of chemistry"*

| Academic chemist | Works in academia as researcher and/or teacher. Requires high-level qualifications. | • Applies their knowledge and skills in a way that is enjoyable and rewarding

• Develops engaging ways to talk about their own work and relate it to wider issues.

• Develops an understanding of the ways in which publics perceive their research.

• Has opportunities to apply for funding and manage activities that would otherwise not be available to junior roles.

Establishes or reinforces identity as a chemist | *"the opportunity to attend [redacted], and the atmosphere, the engagement, the different events, we were able to go to had a profound impact on the whole team. And that team included chemists, right. …particularly that chemist [redacted]… I know from talking to her individually, that it had a profound impact on her… she's since gone into policy"*

"as a, let's say, early career scientist or academic, I've had really good support so I feel like they've been really thorough with their applications, of course, you know, it is not, it's not a trivial application to complete, but they've provided the support, and I think they've been an extremely, extremely positive force in my, my career" |

It is worth noting that there is no reason why these journeys should not be available to all participants, or experienced by each type; rather, that for this cohort of projects, these are the journeys typical to those types. The Professional Chemist persona was where this is particularly apparent; in the interviews these roles were described as having less scope to engage with the whys and hows of engagement projects, and rather were brought into developed projects for their chemistry expertise.

Case study: School chemistry sessions, developing chemists' skills

Funding context: Award made to Dr Hessam Mehr, an early career chemist working in at the University of Glasgow. Funding was awarded for a series of workshops to be delivered in a local school. RSC funding enabled the project to be developed in conjunction with the class and their teacher based on their interests and needs, as well as procurement of specialist equipment.

A key aspect of a successful academic career is the securing of additional funds for your work, but getting a first step on the funding ladder can be daunting. For Hessam, the Outreach Fund provided the perfect opportunity not just to be seen securing funding, which was valuable to him as an early career scientist, but also to work on the storytelling he could do around his work. Hessam's research niche is quite abstract; the challenge of taking it into a school environment and making it relevant to the young people was something he was excited to do, but he needed the permission and freedom of a grant to justify the work. Hessam planned an initial introductory session for the school, where he introduced himself, his work and found out more about what interested the young people to inform later sessions. In the end, through a series of conversations, the support of friends, and a lot of tinkering with equipment, Hessam ended up designing mini versions of his own lab equipment and programming system out of everyday materials and relatively accessible programmable computer boards, that the students could build themselves and take home. Hessam enjoyed seeing the students develop interest in his work, seeing the value they placed in owning the technology that they were talking about, and facilitated their engagement in a way that was meaningful to them; in his words "*their enthusiasm nourishes me*". In doing so he improved his own understanding of his equipment, research and methods of engagement, making a very complicated and advanced technical set-up accessible to the young people he was working with. And importantly for Hessam, he also evidenced a key skill for any post-doc: securing funding.

Conclusion

Funded projects partner with, are led by and consult many different types of chemists. There is evidence of professional development across the spectrum from initial skills development e.g. communication to nuanced complex demonstration and teaching techniques. Project teams and applicants need to be better supported to understand the ways in which contributing to outreach and engagement work can provide professional development for chemists in order to be able to fully articulate and comment on this issues across the Outreach Fund process from application to evaluation. Interviews allowed us to prompt project teams to reflect on their experiences drawing out the many ways in which participating chemists develop their skills, knowledge and practice.

Recommendations:

A. In order to address the lack of awareness around the professional development of chemists amongst applicants and chemists, the RSC could highlight where the skills required for engagement and outreach contribute to the success of chemists. Existing areas such as professional accreditation and recognition which reward these skills could be drawn on to evidence value.

B. Consider establishing more advice and support for applicants on how each partner/partner organisation might be expected to be impacted upon by the grant, perhaps informed by the personas above or a similar attributes framework. This would help twofold; it establishes the expectation that all partners will develop their skills and practice, and also allows for better evaluation against scheme aims.

3.2 Raising aspirations

We continue in this section with the evidence for another of the Outreach Fund's aims to "Engage with school students – inspiring and raising aspirations of student audiences to nurture a future generation passionate about the chemical sciences". We begin with a summary of the type of engagement with schools followed by a discussion of the impact on schools and on other audiences. The case study in this section reviews the experiences of an environmental charity developing workshops for primary schools where RSC funding supported the involvement of chemists. During the analysis it was apparent that grant holders did not have a shared understanding of what raising aspirations means. We have interpreted raising aspirations as students having a positive experience which encourages them to continue their study of chemistry or pursue their interest in the subject. For some this may mean going on to study the subject post-16 but for others it may be maintaining an interest in the subject.

Engaging with schools audiences

There were many projects engaging with school audiences (75% of projects). The aims of these projects varied with many aimed to increase participation in chemistry qualifications post-16 and to encourage pupils to consider routes into higher education and a chemistry-related career. Curriculum-linked projects were often delivered in partnership between schools and universities. School pupils of all ages were encouraged to make connections between their experiences in the classroom, their own lives and research.

Projects also introduced opportunities for more diverse role models to be featured and this included people from across genders and ethnicities. These opportunities made it more likely for pupils to see themselves in a chemistry-related journey. As this feedback shows, these opportunities align closely with the Chemistry for All research (Mujtaba, Sheldrake, Reiss, (2020).

> *"Some of the challenges we have faced during this project were around overcoming very deeply ingrained pre-existing stereotypes within communities of colour that Chemistry isn't for people like me. This is due to the lack of visible role models of colour. Young people struggle to be something that they cannot see. As such some of the young people we worked [with] didn't initially see Chemistry as an option or as a path they could take into a career role. Having an Asian female curriculum developer and delivery lead, and other role models of colour within the [redacted project name] was vital to dispelling these perceptions."*
> (Grant holder feedback)

Many projects took an interdisciplinary approach combining chemistry with art, history and other subjects and there were significant opportunities for pupils to take part in experimental work.

Impact on schools

These experiences provided students with an opportunity to improve their awareness of how chemistry links with real life and this has *"greatly improved pupils' confidence"* (Grant holder feedback). Teachers also reported that projects successfully *"changed their [pupils'] perception of chemistry and the sciences as providing options for future careers/study"* (Grant holder feedback). The projects also ensured pupils were able to experience chemistry for themselves and gain an understanding of the process, encouraging them to develop their curiosity: *"The session helped the children come up with wonderful questions to investigate themselves."* (Grant holder feedback). In one tutoring project students reported that the experience had helped them feel more confident about learning and had positively impacted on their end of year grade and for some it helped them identify that chemistry was something they wanted to pursue at university. For many projects raising aspirations and providing inspiring experiences go hand in hand and this is discussed in the following sub-section.

The STEM professionals involved in these projects recognised the importance of their own involvement when addressing inclusion and diversity issues:

> *"It's so important to break stereotypes, particularly as we've come from different routes into our careers (apprenticeship, uni, PhD). We'd love to get involved in more activities like these."*

> (Grant holder feedback)

Leveraging local places of study and local industry links to make the content relatable and accessible had significant effects on projects and their outcomes:

> *"I felt what was nice about this funding, as well as with the routes into STEM, they're seeing people that, you know, these schools in [redacted place name]... it's kind of achievable for them, you know, it's not saying, oh, yeah, this university in London, or you could do this, that's miles away from your house. This is like you could do this, you know, if you're enjoying this, and you like what you hear from these professionals? You know, this can be your career."*

> (Interview with science communication professional delivering a programme for schools)

This is an aspect which is core to the Science Capital Teaching Approach (Godec et al. 2017).

Importantly, projects could have an impact beyond the direct pupils being engaged:

> *"This experience resonated also throughout the entire school; in fact, pupils discussed what they learned not only in class with their teacher but also with their friends from other class during lunch time."*

> (Grant holder feedback)

As part of the review there were different examples where audience groups had raised aspirations and this was not limited to traditional school or youth audiences. For example, within a group of prisoners who engaged in a project *"3 members of the audience [are] now*

stating they aim to gain qualifications related to the chemical sciences" (Grant holder feedback).

Inspiring audiences and project teams

It was common within funded project aims and objectives to include a reference to inspiration, with over one third of the projects including some kind of mention. These references were not only relevant to school audiences but to all audience groups and in a small number of cases, project partners too. In general these references fell into the following main categories:

- Encouraging young people to pursue chemistry in terms of further study or as a career.
- Supporting the development of a positive attitude towards chemistry for all audience groups through an inspirational experience.
- For creatives, e.g. writers and artists, to be inspired by their experiences with chemists and chemistry to produce a connected piece of writing or art.

The activities planned to provide 'inspirational experiences' included the opportunity to engage with "real-life" chemists as role models, to hear about the range of career opportunities available in the chemical sciences, to participate in hands-on topical chemistry experimentation and challenges and to incorporate chemistry into theatre and drama productions.

In terms of the successes within this area of inspiring people and raising aspirations, there is the opportunity for wider communication of fund's activities, especially as ASPIRES3 notes "Research focusing on chemistry participation and engagement is sparse" and "Access to good-quality, engaging chemistry work experience and outreach can help, but is often limited" (Archer et al. 2023). There is significant evidence that Outreach Fund grant holders are positively engaging people with chemistry and this can be communicated further.

Case study: Schools practical workshops, supporting students and teachers

Funding context: Award made to The Country Trust, an environment-related charity. Funding was awarded to develop workshops that linked directly to the English primary curriculum 'rocks and soils' component, with explicit science links. RSC funding enabled the involvement of soil scientists and upskilling additional STEM ambassadors with soil science knowledge.

For this organisation, enabling people to have agency to care and to act is at the core of what they do, through a range of opportunities and experiences. Having come up with a great idea for a way to explore the science of a key component of our life support system – namely soil - they realised that they didn't quite understand exactly how it worked themselves. This prompted a learning journey that led to an application to the Outreach Fund. By bringing in specialist soil scientists they were able to create an activity that was both engaging and fun but rooted in curriculum relevant science. The activities looked at how humans interact with, depend upon, and are changing soil, and every child involved got to meet a professionals who were just as interested in the activity as they were. The sharing of knowledge was essential to the success of the project, as the Jill Attenborough, CEO of The Country Trust says:

> *"Teachers loved it because they, the children, were able to lead the learning. So they asked questions and more questions and more questions and the scientists were able to answer. Whereas if the teacher had been leading on rocks and soils, which is a [year three] part of the primary curriculum, they would very quickly have just shut off the children, because they couldn't answer the questions. So, the learning would have would have just stopped. But with the scientists there, it was able to go and go and go and go. And the teachers found that really exciting to see how their children's learning was able to develop"*

For this organisation, what was most important was that the participants went away feeling some sort of empowerment, and having the scientists involved enabled that. Participants and delivery teams learnt together as well as relying on the scientists for knowledge, and the young people went away excited to repeat the activities at home. The charity felt that the RSC funding provided a type of legitimacy for them when navigating the wider STEM environment but would have loved more access to RSC members or networks to help them find scientists to involve. The central team were essential to getting the project in place; it was through them that Jill suggested she had been given the "*confidence to continue*" with establishing this project.

Conclusion

There is evidence from the review that audiences aspirations have been raised and that there have been impacts on awareness of chemistry as a future career and improved confidence and curiosity in relation to chemistry. All of these impacts positively contribute to the Outreach Fund's aim of "inspiring and raising aspirations of student audiences to nurture a future generation passionate about the chemical sciences". It would be of benefit to grant holders if the RSC were able to provide more guidance around how to engage with the goal of raising aspirations, especially in terms of finding a common framework for discussing the impacts and outcomes. For example, many STEM engagement funders and providers use the Science Capital Teaching Approach (Godec, King & Archer 2017) as a way in which to frame the discussion. The shared goals of the Outreach Fund and the work of RSC teams could be strengthened through development of a framework to gather and share data, evidence and feedback linked to raising aspirations through education and through outreach.

Recommendations:

C. Use the Science Capital Teaching Approach (Goden et al. 2017), or another research-informed framework, when asking grant holders to describe the benefits of their project for school audiences at the application stage. The project can then be reviewed against these outcomes as part of the evaluation process.

D. Consider adding 'public audiences' to this aim alongside school audiences. There has been evidence of non-school audiences having raised aspirations and there are certainly instances where the experiences have been inspirational.

E. Work with grant holders to communicate the successes of the projects using appropriate internal and external formats and channels. This includes but is not limited to effective practice and impact. The format and channels utilised should be proportionate and tailored to the desired audience and purpose.

3.3 Opportunity to highlight topical nature of chemistry and its relevance to people's daily lives

The next Outreach Fund aim to be examined is to "Engage with public audiences – involving a wide range of people in relevant contemporary issues in the chemical sciences". This aspect of engaging audiences with chemistry is described in the Outreach Fund aims as being linked to working with public audiences, but it is clear that schools-focussed projects are also delivering against this aim. We begin with a look at the ways in which chemistry topics were incorporated into the projects and how these topics were chosen. This is then followed by two case studies. The first discusses how an arts organisation incorporated chemistry into their activities and the second looks at the experiences of a project engaging with a highly topical event, COP 26.

Incorporating chemistry topics

Throughout the reporting from grant holders there were examples of how different topics from the chemical sciences were highlighted in terms of relevance to people's everyday lives and links were made to current events. For example, one project focused on how chemical sciences contributes to meeting the climate challenge with the aim of sharing information and put on events aimed at engaging different audiences around the time of COP26 in Glasgow. In addition to the focus on chemistry topics, the relevance of chemistry to people was seen in projects which looked at the science behind cultural practices and where role models from a range of different backgrounds and experiences were highlighted. These aspects often inform the motivations for individuals engaging with the scheme:

> *"I'm a STEM AMBASSADOR, and I come from a low socio economic background. And I was one of the children that got told at school that I would never go to university. So for me, it's really important for people to have role models, particularly women in STEM, particularly people from low socio-economic backgrounds and underrepresented groups, just to make it know(n) that STEM subjects are accessible, higher education is accessible to all should be accessible to everyone."*
>
> (Interview with academic running an outreach programme to schools and communities)

Through the interviews it became clear that whilst making chemistry relevant sits at the core of the funded projects, the decision-making process to arrive at a final topic and communication mechanism is not linear or predictable. Some applicants had existing engagement mechanisms that they wished to take to new audiences or add new topics to. Some had existing relationships with audiences, again wishing to bring them more diverse content. Others started with a key research project or fundamental of chemistry before determining an audience or mode of engagement. Several interviewees commented on the fund as being a great starting point for such journeys, funding exploration of relationships, delivery mechanisms, and of communication and engagement mechanisms. Overall they

indicated feeling trusted by the RSC to do what they know well, and to do their best at the rest of it. As previously highlighted, it was unclear as to how any learning from the projects might be communicated, this time with the focus on ways in which to identify and incorporate chemistry topics; with parallels to the previously discussed ideas of introducing networks, much of the learning so far has stayed within funded organisations and their direct networks, rather than being shared more widely.

Case study: Science Circus project, broadening understandings of who is a chemist

Funding context: Award made to Circus 250, an arts-based organisation who use science themes in their work. Funding was awarded for a circus show that specifically included chemistry elements. RSC funding enabled development of chemistry aspects, attempts to engage external chemists, and travel to rural areas.

Including science themes in an unusual context is everyday practice for this small arts organisation. Having decided that chemistry should be their next focus, after successful physics and engineering focused projects, they reached out to the RSC for support after hearing about the fund. With an employee who already had a chemistry-related background, they reached out to various academic and industry environments for support. But the key element for them was that everyday tasks be recognised as science, in this case specifically chemistry, so they took a broad lens on where that support might be found. Brewing and distilling were identified as important local industries, and pubs formed focal points for local communities, so this was the natural chemistry connection. As Dr Dea Birkett, Director and Ringmaster of Circus250, described this seemed logical to them, but wasn't always the easiest connection for their communities to make:

> *"They don't call themselves scientists, but they are. They're doing chemistry. Every time they pull a pint, they're doing chemistry"*

By joining up a well-understood local practice with the more formal contexts of chemistry and chemist, this project reaches large audiences from areas not normally able to access STEM engagement, bringing with them the message that chemistry is, relatable, fun, and a viable future option for all. They would like to be able to add more academic and RSC member links into future work, to push their chemistry content further, but it's not clear how that can be enabled yet; at least the building blocks for this work are firmly in place.

Case study: Climate change activities for COP 26, engaging young people with chemistry, renewable energies, and policy making

Funding context: Award made to PPL PWR, a small not-for-profit organisation who involve the public in aspects of sustainability and decision making. Funding was awarded for a series of activities with school groups to be held in the run up to and at COP 26 in 2021. RSC funding enabled partnership with an academic chemistry group with hydrogen fuel cell expertise, along with travel and tickets for young people to COP 26.

The impending arrival of the COP 26 Climate Change summit to Glasgow in 2021 acted as a prompt for this organisation to look at how their work might be more connected to chemistry research. With an existing remit to link public groups to the places and processes of decision making, COP 26 provided a climate focus. Personal interest of the organisation members, including Dr Anna Hands, the project lead, and existing connections to relevant academic research groups created a critical mass of factors that encouraged them to apply to the RSC for funding for their plans, but it was the RSC's signposting of interest in the conference in the funding scheme terms that made this application finally happen, as Anna explains:

> *"I don't think we would have thought to apply if it hadn't had that sustainability note… and then subsequently RSCs priorities about sustainability came out as well, which I was really excited to see. But I think that was in 2021, later after we applied for the funding."*

An existing schools network with a focus on sustainability provided access to the young people, and schools appreciated the links to chemistry as part of the offer. Organisation volunteers and chemistry students were trained to engage the young people with the research and policy work in this area.

At the conference, school students created postcards with art and poetry inspired by sustainability themes and sent them to their MPs, as well as meeting with senior government officials and feeding into policy decisions because of their participation in the conference fringe events. The RSC had a presence at COP 26 through the use of branding and links to resources. One of the volunteers went on to move from research into policy making as a result of their participation, and attending the conference was felt to have had a huge impact on everyone who was part of the project. They would have liked more access to RSC resources in the run up to the event, feeling they could have offered more of a presence with additional connection to the education and communications teams, and would have happily engaged members in their delivery. However, they really appreciated the support they did have, and valued the flexibility shown through the COVID-19 pandemic, allowing them to still deliver a successful project as different partner costs and circumstances changed substantially.

Conclusion

There are many different ways in which the projects have incorporated chemistry into their projects and what is topical to one group of people isn't necessarily going to be topical to the RSC. Important to many of the projects is highlighting the relevance of chemistry, whether that is through where chemistry can be found in the local area or how it relates to people's everyday lives, this approach is commonly used as a hook with many different audience groups. It can be seen that across the Outreach Fund projects there are many examples which link to the RSC campaigns and areas of work. What is needed, rather than changing the scheme to better align with RSC strategy and work, is instead to better communicate the funded projects and their outcomes to show the connections to other RSC priorities.

Recommendations:

F.   Provide short primer resources on topics of interest to the RSC, such as those currently considered to be key campaigns, to help applicants indicate if they feel their work is relevant to these areas. Whilst this need not be prerequisite for funding, it would help tie together RSC priorities with the funded projects and might enable further support from within the RSC. We would also encourage including more emphasis on the importance of relevance within the description of the aims as this would better reflect what is happening in practice.

G.   Consider adding a reference to school <u>and</u> public audiences as part of this aim. This addition would help to solidify a connection to science capital as this has a strong emphasis on relevance and the topical nature of science in its framework.

H.   Identify ways in which grant holders can share their experiences of incorporating chemistry into their projects, this could be achieved through peer-to-peer networking sessions.

I.   Collaborate and communicate with colleagues in other areas of the RSC, e.g. communications and education, to share project outcomes and impacts which are relevant.

3.4 Reaching under-represented audience groups

The Outreach Fund does not currently provide a detailed description of under-represented groups in the chemistry community, however people with disabilities and people facing social, economic and educational disadvantage are highlighted in the guidance (Royal Society of Chemistry 2024b). Whilst this allows the projects to determine who to work with, informed by national and local evidence, it would be helpful to applicants if the RSC were to be able to provide some expanded guidance on identifying these groups. Other funders take this approach. The Institute of Physics provides guidance on under-represented audiences in physics they would like to see engaged as part of their grant funding schemes and uses findings from their evidence-based Limit Less Campaign (IOP 2023)[3].

The RSC has drawn our attention to schemes already taking this approach within the organisation (e.g. the Broadening Horizons mentoring scheme, Royal Society of Chemistry 2024a). There is a suite of research undertaken by the RSC in recent years which identifies barriers to engagement, retention and progression in the chemical sciences associated with a number of characteristics including ethnicity, disability, sexual orientation and gender (Royal Society of Chemistry 2024c). In addition to this research, there are established definitions of inclusion and diversity in the RSC strategy:

> *"By 'inclusion', we mean that people feel they belong in the world of chemical sciences. By 'diversity' we mean anything that can make us different from others. This includes (but is not limited to) demographic background such as gender, ethnicity, age, disability, as well as areas such as socio-economic status and education."*

(Royal Society of Chemistry 2023).

Recent relevant findings which the RSC may wish to draw on when supporting applications is the ASPIRES3 research (Archer, DeWitt, Godec, Henderson, Holmegaard, Liu, MacLeod, Mendick, Moote & Watson, 2023). This identified that students with characteristics relating to gender, ethnicity and socioeconomic status as more likely to experience barriers to progression and engagement in chemistry.

We now consider the projects who have identified themselves as working with an under-represented audience group.

Project engagement with under-represented audience groups

As part of the applications process, grant holders were asked to identify whether they were working with an audience that is under-represented in the chemical sciences. As discussed, a proscriptive definition is not included in the guidance and it was up to them to identify the

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[3] These groups are: girls and young women; disabled young people; LGBT+ young people; young people from disadvantaged backgrounds; and Black Caribbean young people.

audience and evidence that it is under-represented in their application. **Around 35% of the projects (n=57) identified themselves as having a focus on working with an under-represented audience and this accounted for nearly 60% of the engagements made by the projects.**

We found that the audience groups engaged as part of the outreach grants were diverse on the basis of project-reported audience descriptions. The following descriptors were used by projects to describe their audiences. Multiple descriptors were used by projects reflecting the intersectionality of under-representation, e.g. the group would be made up by female young people from an area of socioeconomic deprivation. The descriptions in Table 7 were categorised by the evaluators based on responses from projects to an open-ended question in the evaluation feedback. The most common descriptors were in relation to ethnicity, socioeconomic status, and disability.

Table 7. Under-represented audience descriptors

Audience descriptor	n	%
Ethnicity (described by applicants as BAME)	28	30%
Socioeconomically disadvantaged	22	24%
People with disabilities	14	15%
People with special educational needs	9	10%
Neurodiverse people	4	4%
Age (described by applicants as young people)	3	3%
Sensory impaired people (blind, visually impaired, deaf or hard of hearing)	3	3%
Gender (described by applicants as women)	2	2%
LGBTQ+ people	2	2%
Prisoners	1	1%
Children in care	1	1%
Young carers	1	1%
Homeless	1	1%
People with mental health needs	1	1%
Total	93	

Many of the projects focused on engaging under-represented communities in chemistry and others looked to widen access to chemistry, for example through working with those in the prison community. For many of the projects that were successful in engaging under-represented audience groups, those groups were already the main target for the day-to-day work of the grant holder. The interviews indicated that although audiences under-represented in chemistry were reached, projects would benefit from greater clarity on the under-

represented audiences the RSC is seeking to support. It also appeared that for many projects their reach was much wider than anticipated or even accounted for in their reporting.

In order to provide more context and clarity to the work being done we reviewed the grant awards by organisation type. The full details of the split can be found in Table 16, Appendix B.

- When we do this, the proportion of schools receiving a grant is the same across those working **with** under-represented groups and those **not**.
- For those working **with** under-represented groups, the 'Education charity/social enterprise' and 'Community charity' categories make up higher proportions within the projects targeting under-represented audiences. 'Cultural organisation' also has a higher proportion of representation in this category.
- Then within the projects **not** working with under-represented groups, the 'universities' and 'Science centre/STEM engagement provider' categories make up slightly higher proportions.

Enabling factors for working with under-represented audience groups

Having considered who is under-represented in chemistry based on the research referenced above (e.g. ASPIRES 3 and the RSC's own work) and who the grant holders have worked with we now review the evidence for the enabling factors supporting successful engagement with under-represented groups. In terms of successfully reaching the intended audience groups, **one key element was the allowance by the RSC for delivery format to pivot or timelines be extended**, mechanisms that were particularly effective during the peak of the COVID-19 pandemic.

> *"During COVID, we have had to change the way we were going to do it because we couldn't get out and about do things. They allowed us to, they agreed to us using the funds in a different way. They've allowed us to target different target audiences if things haven't been going well. So it's really just that flexibility to explain to them, Look, this has taken a bit of a turn, are you comfortable with that? And I'm sure they would say no, if you were going off a complete tangent, but if it's if it's something that they still feel is sensible, then they agree."*
>
> (Interview with university-based academic delivering an outreach programme for school audiences)

The benefits of this flexibility were especially apparent during the COVID-19 pandemic where this allowed grant holders to take an iterative approach. This meant that projects were able to continue, albeit many in a different format than intended. For some projects, they offered vital opportunities for chemists to engage in outreach projects when opportunities to do so were limited. With the shift in project format there were also several projects who moved to

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supporting homeschooling during lockdowns, for example with online video content or experiment boxes sent to the community.

By continuing to fund projects during the pandemic, and by being responsive to the needs to the organisations applying, the RSC were able to provide support to schools, teachers and families who were homeschooling. For example, as a result of their grant award one organisation was able to bring staff back from furlough and provide them with an opportunity to review and develop their chemistry offer. The grant holder reported that this had multiple positive benefits, including on staff wellbeing.

Another key factor was the reach the scheme is having by funding organisations already designed or determined to work with under-represented audiences. The application process as it stands successfully prioritises projects targeting relevant audiences, and the interviewees were able to talk about their target audiences in a strategic and thoughtful way:

> *"It's kind of like, okay, we went to groups that were underserved. But they are people that it wasn't our first time to go to them because like even I would have to acknowledge that like some of those groups, like the first time you go to them, it takes a couple of months because you're both sizing each other up."*

(Interview with outreach professional working with community groups)

The interview descriptions of circumstance and environment showed depth that a single categorisation of audience on a form cannot.

Alongside this, the grant holders expressed a sense of security in their understanding that the RSC was looking for quality engagement rather than purely focusing on reach, which enabled them to more strongly focus on specific audiences. This message was pervasive, and acted as a strong indicator to the grant holders as to the direction the fund was headed in for the future.

Case study: Off-line chemistry boxes for families, reaching a broader audience thoughtfully

Funding context: Award made to local small enterprise, UK Unplugged CIC, specialising in developing hands-on and cost-effective activities for families. Funding was awarded to create a chemistry session. RSC funding enabled development of a chemistry activity box for use directly in workshops and training for some groups to use by themselves, as well as meaning that additional chemist input was sought during development.

One of the benefits of the Outreach Fund being so open in its remit is the capacity to attract specialist providers, like UK Unplugged CIC who works with families in an underserved area. Dr Diana Powell, the grant holder, works with a small volunteer team to develop resources designed to bring families together in learning and play activities. Each activity has a focus designed to be relevant to the real world, so for chemistry they decided to tackle elements of climate change, with the support of a team member and volunteer director, Joanna, who has an Engineering and STEM advocacy background and volunteer Daniel whose job involved Environmental Chemistry. The new work being done was around developing the content; Diana and her team already worked extensively with local community groups to identify some of the barriers they might face to taking part in enriching activities and try to overcome them. Their final approach includes going to spaces where the groups felt comfortable, including more people rather than restricting numbers, allowing siblings to attend sessions for more targeted groups such as those with special educational needs, and doing anything they can to reduce the burden of time, organisation or cost on the parents and care-givers. As Diana says, often funding organisations want efficiency over thoughtful approaches:

> *"From a monetary perspective, they want just SEND children. Of course, a parent might have one child with autism, but that doesn't mean all of their children have autism. So then the parent has to provide care for their neurotypical children separately. This creates all kinds of messy scenarios. So we get funders to agree to making it more open for that event and we support the whole family. And the feedback we get from families is really positive."*

Every external funder has their requirements, and in this case the requirement to include a chemistry partner was a cause of some stress for Diana and her team. The project was delayed as they tried to reach out to new chemistry contacts and academic partners in particular. But through the local RSC network a contact was eventually made, and the existing expertise in the team meant much of the work had already been done, so when everything came together it did not take long to get back on track, aided by the support from the central RSC team and flexibility inherent to this scheme.

Conclusion

The projects being funded by the Outreach Fund are working to address barriers to engagement and progression highlighted by the RSC's own research and other recent findings (e.g. ASPIRES 3) and compliment other work being undertaken (e.g. Broadening Horizons). We would conclude that the Outreach Fund successfully met its aim to "Provide under-represented audiences, communities and places with inspiring chemistry engagement opportunities, delivered or coordinated by skilled people". There were three key enabling factors to this:

1. The flexibility of the scheme in allowing projects to pivot their delivery mode and extend timelines.
2. Funding organisations who specialise in working with under-represented groups.
3. Providing reassurance to grant holders that quality of engagement over the scale of reach was at the centre of the scheme.

Having said this, more could be done to systematise the targeting of audiences who have strategic relevance to the RSC, as well as the recording of data with respect to how audiences are chosen and targeted, which could be aided through the following recommendations.

Recommendations:

J. Highlight, informed by the available evidence, the groups that are under-represented within the chemistry community. Retain sufficient flexibility for organisations expert in working with under-represented audiences to apply their knowledge and experience in the shape, design and delivery of their projects.

K. Include a more detailed question about the audiences worked with and how they would be reached in both the application and final reporting forms. The interviews saw much more nuanced and detailed descriptions of audiences and why they were relevant and important to the work, if not necessarily considered to be "under-represented". This information is currently being overlooked and provides richness when considering the impacts of the funding.

L. Continue to fund a range of projects who do not explicitly reach under-represented audience groups ensuring a range of cultural and geographical spaces are served to ensure there is not the emergence of a chemistry gap.

3.5 Developing professional networks, relationships and working collaboratively

This section reviews:

- How chemists have developed their professional networks followed by a description of relationship development and collaborative working.
- Opportunities for more facilitated engagement between projects and RSC members.

The case study illustrates how an Outreach Fund grant holder developed their professional network and worked collaboratively to successfully deliver their project. Developing professional networks, relationships and working collaboratively is also considered to contribute to "building capacity and opportunities" referred to in section 3.1.

Developing a professional network

Participating chemists highlighted how the grant award has helped them to develop their network of professional connections both inside their organisations and with external partners. There were also several references to the impact of the award from the RSC helping to secure further funding and to raise the profile of the project.

> *"I believe that the support the RSC gave at the beginning of the project also helped us to secure other funding. Having such a prestigious organisation back you is always good!"* (Grant holder feedback)

For grant holders, it made it easier for them to engage with new partners and funders as the award was backed by the RSC contributing to projects leveraging additional funding and resource

Relationship development and collaborative working

There were a number of instances where projects were developed and or/delivered through collaboration and co-creation across sectors, disciplines and professional groups. The awards include a range of different team and participant collaborations including artists, chemists, teachers and young people and academic staff supporting undergraduates to work with secondary school pupils.

Even though the impacts of collaboration aren't necessarily apparent in the reporting paperwork, all of the interviewees spoke highly about at least part of the collaborations and partnerships they formed. This interviewee found one partnership in particular to be a type of professional development as well as helpful to the project:

> "*And from there, it was kind of like almost like a bit of a mentorship where she really guided me, there was the networking opportunities that she gave, introduced, and in quite a few meetings kind of tagged along in the team's meetings. And then from this, I had that conversation of what am I looking for? And how do I put that across in conversations as well, if that makes sense?*"

(Liam Johnson, a school teacher working with industry, school students and families)

Liam's experience is described further in the case study at the end of this section.

However, grant holders are not always able to specify the ways in which the partnership impacted their process or understand the difference between an effective and an ineffective partnership. Those who had poor experiences always went on to find more supportive collaborators, even if those collaborators inputs were limited compared to the aspirations of the project. The RSC's flexible approach to project support, delivery, timelines and access to a specialist team helped projects to navigate these changes and identify alternative options. The knowledge and care held by the RSC team is invaluable.

Projects also highlighted that more could be done to improve options for collaborations and partnerships to be formed. The most striking opportunity was joining up with RSC membership. Grant holders highlighted a desire for RSC member support during distinct phases: to advise on application development, to assist with finding a chemist to partner with, to advise on resource/script development, and to attend and promote final outputs, to ensure inclusion of relevant chemistry expertise. Grant holder aspiration was primarily based on assumptions and desires on their part, rather than a solid understanding of how members interact or what the local, regional and national structures might actually look like. As this interviewee highlights, sometimes the application has to be put in before the partnership building can occur or access to expertise can be arranged, which puts different pressures on the content of the application form;

> *"I think there was a question, […] what particular elements of chemistry is it [the project] going to reflect, and we kind of know, but I'm always terrified I get the language wrong. I would love an academic to be able to just look over that bit, which is going to take them like 20 minutes and say, no, that sounds okay, what you're trying to achieve there sounds achievable. I know that's before we get funding, so it's kind of weird."*

> (Interview with professional from an arts organisation working with school and public audiences)

The other key area highlighted with respect to networking was within the grant holder group themselves. Many projects expressed the potential benefits of being connected to other projects within the fund. This would reduce the feeling of 'being the only one.' It was felt that better connectivity would be particularly useful to help keep abreast of thinking with respect to reaching and having impact with audiences, and ways to promote and evaluate projects. Several grant holders indicated they felt that they were the first project of a particular type to have been funded, or even the only one ever, so such networking would also help with contextualisation for their work.

"I didn't have any contact with anybody else in [the RSC Outreach Fund] scheme. So I don't know who else got funding, I don't know what they were doing. I didn't see. I mean, there may have been a website with all that information on but I never saw it. So it was very, very much like we were doing our own little thing in isolation. Whereas with the STFC [nucleus] grant scheme, you felt like you were part of a of a community of people who were all trying to do similar things, you know."

(Interview with university-based academic delivering an outreach programme for school audiences)

Case study: Multi-school STEM event, building up confidence working with multiple stakeholders

Funding context: Award made to Liam Johnson, a primary school teacher leading on innovations in teaching practice for their school. Funding was awarded for the Humber STEM Event, a multi-school event comprising STEM-themed stands and workshops for local schools to visit. RSC funding enabled schools from remote and underserved areas to attend, and created the space for conversations between Liam and a local RSC member.

With no formal science background, Liam has led on changes to IT infrastructure and enrichment for many subjects, including English and art, for his school. When he decided to tackle enrichment for the science curriculum, he hadn't expected to find so much interest or momentum to support his work. Liam looked for possible partners through parents, teachers, and governors from the school, as well as cold calling to various scientific organisations in the area. Through this Liam connected with an RSC member, who suggested applying to the Outreach Fund. This contact proved invaluable in connecting Liam to various STEM networks and industry links locally, gaining various offers of help. It also provided him with someone to lean on who was more comfortable moving around in science and industry circles.

> *"And from there, it was kind of like almost like a bit of a mentorship where she really guided me, there were the networking opportunities that she gave and introductions made… And then on from these, I had that conversation of what am I looking for? And how do I put that across in conversations as well?"*

What started out as an opportunity to introduce the children at one school to some scientists ended up developing into a huge event, filling a sports stadium with many science careers and demonstration-based stands and workshops, with children from multiple local schools passing through. RSC funding allowed schools to have their travel and attendance expenses for the event paid for, meaning that schools who wouldn't normally get to participate could. The event continues to grow, and Liam has secured additional funding from the participating businesses to support schools to attend in future years. Liam has gone from putting on an event to managing an impressively large and successful STEM engagement activity, developing his skills as a leader, facilitator and broker. More could be done to tap into this in the future. Liam does this work outside of paid school time, and does not know the STEM outreach environment beyond, so there are opportunities out there that he has yet to tap into, such as university outreach programmes. Liam acknowledged several times that this work is something he does in his own time and that there will be a limit to this at some point; it remains to be seen if the event could be handed over somewhere or if it will fade away if the resource Liam currently provides is lost.

Conclusion

There were many ways in which grant holders were able to expand their professional networks and build relationships in order to work collaboratively to deliver their projects. However, in this area there were also significant challenges and barriers experienced by grant holders, especially in relation to accessing chemistry expertise and feeling isolated from other projects.

Recommendations:

M. Consider offering seed funding to support relationship development in order to allow applicants develop stronger more focussed applications. A two-stage application process could be considered for emerging projects drawing on the practice of other funders e.g. research funders.

N. Facilitate opportunities for grant holders to form as a community that can share challenges and successes, consider practice in priority areas e.g. evaluation, providing peer support and consider the national practice and funding context.

O. Consider mechanisms for better connecting funded and/or potential projects with RSC members to access specialist advice, expertise and where appropriate volunteers.

3.6 Professionalism of outreach projects

Whilst the following section doesn't address a specific aim within the Outreach Fund, it is an aspect that speaks to RSC strategy and organisational aims in terms of supporting the development of practice and increasing opportunities for engagement with chemistry. We first examine the ways in which project actions resulted in an improvement in quality and practice and ways in which these aspects can be further supported. Following this we describe ways in which specialist expertise positively impact on project outcomes. The case study describes the experiences of a project led by someone with specialist creative expertise and how they worked with the RSC and others to improve their own practice.

Improving quality and practice

The interviews identified a series of themes around how improvements in quality and practice were implemented, where areas for further improvement were identified, and ways in which they manifested, shown at a glance in Table 8.

Table 8. Improvements in quality and practice

Actions which led to quality delivery	Requests for further support	How quality was identified
Application developed in collaboration.	More reliable access to chemistry and outreach experts.	Clarity of chemistry messages in project descriptions, deliverables and reporting. Clarity of engagement process and audience consideration in project descriptions, deliverables and reporting.
Projects are well informed by current thinking in good engagement practices.	More reliable access to up to date thinking on issues of engagement and inclusion, particularly as considered by the RSC.	Participants report meaningful outcomes from engagement. Target groups are well considered and defined from the outset. Participants are primarily from the anticipated target groups.
Projects pause for redevelopment/delivery pivot when needed.		Projects reach intended groups in meaningful ways. Numbers are sometimes lower than anticipated but remain within the target groups.

Locations (physical and virtual) are relevant, accessible and well managed.		Projects reach intended groups. Numbers are sometimes lower than anticipated but remain within the target groups.
Chemistry content is relatable to audience, even when broaching abstract concepts.	More could be done to draw connections between areas of "pure" chemistry and contemporary public issues.	Participants taking ownership of content, wanting to continue work outside of the project spaces, considering themselves to be like chemists, considering themselves to be chemists (or have the potential to be).
Project resources are well designed and have longevity beyond the project timelines.	Increased exposure to good quality resources and new ways of producing, storing and sharing resources.	Project resources are used by participants during and after the project timeline. Project resources show good practice for accessibility and inclusion, relevant to their content.
Project stakeholders use reflective processes to consider the impact of the grant work.	Introduction of some basic principles and formats for reporting from the outset, as well as sharing practice between projects and from old projects, could drastically improve the evidence available to support understanding of impact.	Projects can clearly express how they have met the goals outlined in their grant application. Projects can clearly demonstrate how any changes made were instrumental in the success of their project. Participant feedback is collected in a way that is meaningful to the project and the RSC connecting to the aims of both the project and the Outreach Fund. (see Appendix A)

Including specialist expertise

There are a few examples where the introduction of specific expertise outside of chemistry has impacted on the project outcomes.

In a small number of projects, the funding allowed for collaboration with professional film makers and social media specialists which increased the standard of the output of the projects and helped to transfer knowledge and skills to chemists and grant holders. There were many instances where there was recognition of the increased professionalisation resulting from the grant award. This was down to being able to engage specialist expertise or to ensure staff time within the organisation holding the grant was focused on delivery.

Interviews showed that bringing professional creatives in was one of several ways in which projects were producing engagement strategies and outputs that were of higher quality than would have been possible without the funding. For many, having the grant funding enabled project leads to feel they had been given authority to act in the realm of chemistry through association to the RSC, which in turn came with the confidence to lean on or share RSC resources. Not least of these was the access to and ownership of RSC resources that grant funding allowed. As this participant put it:

> *"So anytime you get money from a from a learned society, it's really good. Because you know that you are getting the name behind it, you're getting that recognition... and quality resources, because we use a lot of the videos that the RSC make the careers type videos in our actual production."*

> (Interview with university-based outreach professional working with schools)

Where they were brought in, having funding for external providers meant that resources had an accessible look and feel, with proven track records in being enjoyable and usable by the target audiences. In some cases this also brought access to the provider's own audiences, and increased reach and legacy; for this interviewee, working with a well-established provider with a strong audience base meant reaching a much wider group than they could have hoped to by themselves:

> *"So it's been really nice to be able to work with [redacted], because the stuff that they do is, you know, it's high-quality stuff. But also, what it means is that, again, our reach is going to be much broader, because the [redacted] is just a website that's free for anybody to use."*

> (Interview with university-based chemistry academic working with schools and the public)

For other grant holders, where outreach was a primary focus of their job, the funding enabled additional delivery that would not otherwise have been possible. This was also of high quality; the types of outreach providers interviewed were varied, and in some cases had established,

well understood mechanisms for reaching their audiences. In these cases, funding provided a route for new content, or a new approach to known processes and content, that was still based on strong knowledge and understanding with the RSC being able to benefit from the expertise of that organisation.

Case study: Science scriptwriting project, improving outreach through resourcing professional time

Funding context: Award made to Luca when they were early on in their career. Funding was awarded to support development of scientifically accurate radio dramas as collaborations between young people and scientists. RSC funding enabled central coordination, pairing, and partnership building.

For many early career individuals, the right pot of funding at the right time can go a huge way towards supporting their career development. This was the case for Luca, who was using their background in science to progress into a career in media production. Having had the idea for a co-created approach to script development, building collaborations between scientists and dramaturgs, Luca received RSC funding to support the pairing, brokerage, and coordination of the project as well as the development of the final scripts. This support time was essential; as an independent worker Luca didn't have the security of a host institution to support the project. Through the project Luca brought together chemists from a range of academic, industrial and charity-based institutions to work with the young people developing their scripts, providing new insight into how and where chemistry is done, and by whom:

> *"It was great to be able to connect the writers with chemists from a range of backgrounds and specialties, and for them to really get that chemistry is cool and varied and everywhere".*

In the evaluation survey that Luca created after the project, one writer's feedback was: *"I renounced science after my GCSEs, so it was so refreshing to learn that arts and science can be brought together to create entertaining and important stories and experiences".* Luca also surveyed listeners and found that 100% of respondents agreed or strongly agreed that the series made concepts around chemistry engaging.

In the end Luca's hours far outstripped the funding awarded but having it there to enable their work was essential. The project brought together various science and arts organisations as well as individuals, and when one stakeholder started posing some additional logistical and financial problems, the RSC team was there to help, providing legitimacy for the grant holder in owning their project, and supportive advice for them as they entered difficult negotiations. This project culminated in the production of a podcast series that was nominated for numerous awards, including winning Bronze for Best New Podcast at the British Podcast Awards 2022 and Silver for Grassroots Production Award at the Audio Production Awards 2021.

Conclusion

The Outreach Fund is funding high quality projects, and the grant holders are overall very able to talk about the ways in which the funding has supported the delivery of good practice as shown in Table 8. Projects that would not have gone ahead without the funding still strove for high quality delivery, in part due to the relationships they built with the RSC. Those projects who would have gone ahead regardless used the funding to reach new audiences or include chemistry where otherwise they would not. More could be done to improve quality further, and direct requests were made by the grant holders for support with some areas. Increased professionalism of delivery through bringing in highly skilled practitioners is one key way in which quality manifested.

Recommendations:

P. Continue to support the scheme with knowledgeable and engaged staff. The grant holders felt particularly supported and valued when their contact was with someone with some understanding of their working environments and engagement practices.

Q. Consider how support and advice could be offered either through the RSC, cohort support or provision within the award on traditional media and social media engagement. Guidance on engagement with RSC communications e.g. social media tagging would support projects in getting the most out of RSC affiliation.

R. Consider the improvements in practice (Table 8) in terms of a set of mini-recommendations (where not covered elsewhere), offering easy-win options for supporting applicants in future rounds.

3.7 Outreach Fund legacies and unforeseen impacts

This section reviews evidence for ongoing legacies and discusses unforeseen impacts which were identified. This came from both the documentary evidence and the interview discussions. As part of the written feedback from grant holders, they are asked by the RSC to consider the following:

- The impact that the project has had on your personal development.
- Partnerships that have developed as a result of the project and how they may continue.
- Resources that were created and how these will be shared.

However, in addition to these three core aspects identified by the RSC there are other areas which have arisen as the data has been analysed. Many of these have occurred at an organisational level and each is now discussed in turn.

Organisational impacts

The furthest reaching impact is that of relationship development. This has occurred between individuals on a local level but also between organisations nationally and internationally. This aspect has been crucial in many projects where they have been working with new or under-represented audiences. Grant holders found that their raised profile enabled them to establish brand new relationships in order to deliver the project and there were many stated intentions to go on and continue the relationship. This was supported by the interviews, where it was established that many were in fact still developing the opportunities raised by the initial contacts put in place for the grant. **Over 75% of the projects (n=127) intended to continue with the partnership which was involved in the funded project.**

Other organisational impacts include:

- For many organisations holding an Outreach Fund grant this was an opportunity to pilot or seed a new idea or activity. This opportunity has then seen a shift in strategy or approach. For example, for one organisation they shifted to local, community-focussed work as their experience with the project "*demonstrate[d] the power of this approach*" (Outreach Fund grant holder feedback).
- For others the grant allowed them to scale-up their activities. This puts the RSC in a strong position in terms of influencing outreach and public engagement activities across the sector.
- The other ways in which this influence emerges has been through the grant holders or project staff/contributors going on to secure funding for further outreach and public engagement activities. The professional development and positive experience of the

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Outreach Fund has given them confidence to continue their work in this area. This has occurred with both the Outreach Fund grant holders and those who have been in the projects as participants. As their confidence in delivering outreach and public engagement activities has increased they have gone on to feel more comfortable in participating in further projects.

The form of many of the projects is such that there are artefacts and ongoing resources which continue to be accessible "*for the foreseeable future*" (Outreach Fund grant holder feedback). **Almost 82% of the funded projects had some kind of artefact or resource available (n=132).** During the COVID-19 pandemic there was a significant increase in digital resources and designs for resource boxes to allow home learning. Resources are available for use by a range of different audience groups. Some examples include:

- Podcasts and other online-based activities can be accessed directly by audiences.
- School-focussed resources can continue to be used by teachers and will continue to impact on their practice.

Other resources aimed at specific groups can be picked up by undergraduate and postgraduate students, academic staff and chemists based in industry.

Policy and media impacts

Seven of the projects identified themselves as being relevant to policy and government audiences. These have involved dialogue-based engagement and have been concerned with ensuring that more diverse voices are heard in policy and in the media. This has occurred in relation to the COVID-19 pandemic and the climate crisis and there were specific opportunities linking to COP26 in Glasgow. These projects were able to ensure young people were heard by policy makers and stakeholders.

> *"Researchers and policy makers have been affected by their personal stories and will take this knowledge of young adults' experiences of the COVID-19 pandemic forward into their own work with influence continuing beyond the end of the funded period."*
> (Outreach Fund grant holder evaluation report)

Shifting attitudes and practice

There were many instances where grant holders said that the project would not have gone ahead if it hadn't been for RSC funding. This is important where new ideas were being trialled or where it created additional capacity within organisations to test out approaches. For some this has crystallised their thinking in terms of the difference they can make through these activities. For example, one partner reflected on the approach they need to take with schools:

> *"To maintain a relationship and promote diversity in chemistry, we feel that long-term engagement with young people/future scientists and their primary influencers i.e.*

teachers and parents is vital to ensure the future of chemistry is as diverse as possible. In addition, this programme ensured role models/mentors are present in school environments on a regular basis to inspire and raise aspirations of those who are typically underrepresented in STEM subjects."

(Grant holder feedback)

It also allowed other projects to collaborate with teachers to ensure the content was linked to the curriculum and the advice provided by teachers was taken into account by the projects in terms of which year groups to target and when.

There has been significant impact on grant holders' skills and knowledge development, along with that of those who have been involved in the delivery of the project. Areas which have benefited include organisational skills, communication skills and project management. There has also been an increase in professionalism in relation to the delivery of projects. For example, those whose project involves podcasting improved their technical skills in relation to this. Where primary and secondary teachers were involved, there was frequently a mention of increased knowledge and confidence which impacts on practice. Other impacts included where one project reported an increase in school science clubs locally following one STEM engagement event for primary schools.

Royal Society of Chemistry as an influential organisation

There are many ways in which the themes discussed in the previous section have resulted in the RSC being an influential organisation. This has occurred through supporting the development of new relationships and collaborations, provided opportunities for chemistry topics to be discussed and linked to peoples' everyday lives. Another important aspect has been supporting organisations in trying new ideas and this extends to having a positive influence on one university chemistry department, which, following a successful RSC funded project, committed to funding ongoing outreach activities.

> *"these resources wouldn't have happened in the way that they are now, you know, the [redacted] really is very high quality, broad reaching work. And without the RSC funding, it just would have been a non-starter. And it was quite nice, because when I got the funding from the RSC, I could then go to the university who then said, Okay, we'll match the funding, so that I was able to produce a lesson with [redacted]. But I think if I just gone to the university and say, I want to do this, they'd have gone, no, we're not doing it."*

(Interview with university-based chemistry academic working with schools and the public)

Another significant indicator of the influence of the RSC is **when asked about whether the project would have been able to go ahead without this grant, only 16% of projects (n=23) said yes.**

Impact of the evaluation study

It is worth noting that as well as there being substantial evidence of impact outside of the impact section of the reporting paperwork, the interviews were also very welcome. The interviewees were very pleased to have the opportunity to reflect upon their projects, and consider the wide ranging ways that their projects had had lasting impact on them and their organisations as well as their audiences. For the project below, a lot had changed since their initial funding period, attributable to the RSC funded work, but well outside of the funding period. Additional grants and business funding were leveraged to continue and grow delivery of the scheme:

> *"And then we'll have [years] 3, 4, 5, and 6, those years doing a stem club or stem event and then this is where the sponsorship money from partnerships will come back in and feed back into the model and it will grow and hopefully become sustainable but like I said, it wouldn't have happened at all without the support and the backing of the RSC."*

(Interview with school teacher working with industry, school children and families)

Investing in networks and engagement with grant holders beyond the funded period will allow longer term impacts and legacy to be visible to the RSC as there will undoubtedly be other aspects emerging which aren't captured in the immediate reporting following funding.

Conclusion

There are many legacies to the Outreach Fund and this is where we see unforeseen impacts emerging. There has been organisational influence where relationships are developed and strategies influenced. There have been positive developments in professional practice and skills.

Recommendations:

S. We would recommend establishing opportunities for longer term feedback to be shared with RSC staff or via an evaluation contractor, as this encouraged sharing that was not incorporated into the formalised reporting processes.

T. Add to the description of Outreach Fund's aims in order to acknowledge that the fund is an enabling factor for a range of different legacies and longer term impacts.

U. Consider more open-ended ways of gathering information on legacy for example follow up interviews or workshops. E.g. rather than providing structured prompts on legacy, leave this more open to interpretation for grant holders.

3.8 Observations

In this closing sub-section of the analysis and discussion we have drawn together a number of observations and opinions in relation to the findings which are based on our own professional expertise and practice. As noted in section 1.4 there is limited published evidence (either peer reviewed or grey literature) about the impact of public engagement and outreach grant schemes and how they are run. This makes it difficult to use an evidence-based assessment as to how the outcomes of the fund sit against the wider sector. However, based on our knowledge and experience of the types of activities being undertaken by STEM public engagement and outreach organisations, the Outreach Fund is supporting high quality chemistry engagements. It is clear to us that the choices being made in terms of who to fund at an individual level are adding up to having a broader influence on the shape and scope of the wider STEM engagement sector. This influence comes through in the form of improved practice and supports relationship development and networking.

In terms of the funding available, the Outreach Fund limit of £10,000 is one of the largest of comparator funds and the availability of this amount to a broad range of organisations is a strength. The Royal Academy of Engineering's (RAEng) fund offers larger grants but does not explicitly fund community-based organisations or creative organisations, unlike the RSC. When considering the aims of the fund, the closest comparator would be the Institute of Physics (IOP). They too encourage community-based and inter-disciplinary projects with the creative industries but the scale of funding available through the RSC is significantly larger. Common to the RSC, RAEng and IOP is a focus on under-represented audiences and this is indeed a sector priority with other national organisations such the Association for Science and Discovery Centres having an inclusion and diversity focus for their work. The RSC Outreach Fund incentivises the inclusion of chemistry in subject specific and interdisciplinary outreach and engagement programmes and our findings suggest that without it there would be a significant gap. The Outreach Fund's aims are open and flexible such that there was nothing we identified which did not align in some way.

A particular area for development for the Outreach Fund is in relation to professional development of chemists. However, in our experience, this is a common issue for other grant schemes. It was apparent in the interviews that the grant holders who were non-chemists did not appreciate the ways in which they could contribute to the professional development of the chemists. This development did occur but this was something which was only evident to us as evaluators and practitioners who work across the STEM sector. There was also limited evidence that the chemists themselves understood their own personal development. Further

work on understanding the additional funding and resources the Outreach Fund is able to leverage would support a discussion of the fund's impact and effectiveness.

4. Conclusion and Recommendations
4.1 Performance of the Outreach Fund against aims

Summary

The Royal Society of Chemistry Outreach Fund achieves a significant amount with the resources it has available. The amount of goodwill, funding and in-kind support it generates within the funded projects is considerable, and is difficult to quantify based on the evidence available but our impressions are that this aspect is significant. In providing a relatively straight-forward way of sourcing funding for chemistry engagement projects, it enables access to chemistry to a wide range of organisations encompassing universities, education charities, social enterprises, science centres, STEM engagement providers, cultural organisations, schools and community charities. This goodwill is seen at every level of seniority in the funded organisations, with projects driven by individuals, volunteers, early career staff and senior or executive staff. In terms of developing of a positive culture of engagement with chemistry, this fund provides the ideal starting point for someone new, the incubation of novel approaches, or building new relationships, all of which are essential parts of a positive culture. The benefits to participants of the projects are broad-ranging, including opportunities for professional development for chemists and inspirational experiences for young people who may go on to consider a career in chemistry. The following Table summarises the key findings against the relevant Outreach Fund aim.

Table 9. Summarising key findings against Outreach Fund aims

Outreach Fund Aims	Key findings
1. Develop science communication skills of chemists – building capacity and opportunities for chemists and chemical scientists to engage with schools and public audiences	The Outreach Fund has provided opportunities for chemists to undertake personal and professional development (section 3.1). Projects have been the catalyst for developing new partnerships and collaborations or solidifying existing relationships (section 3.5).
2. Engage with school students – inspiring and raising aspirations of student audiences to nurture a future generation passionate about the chemical sciences	The projects have inspired and raised aspirations of many different audience groups, not just schools (section 3.2).

3. Engage with public audiences – involving a wide range of people in relevant contemporary issues in the chemical sciences	The project topics have helped people to make connections between chemistry and their own lives and as a result are better able to see the relevance and importance of chemistry to them. (section 3.3).
4. Provide under-represented audiences, communities and places with inspiring chemistry engagement opportunities, delivered or coordinated by skilled people.	Grant holders have worked with diverse audiences, reaching those who are under-represented within chemistry (section 3.4).

The core strengths of the Outreach Fund are in its flexibility and the breadth of activity being supported by the grant awards. This is in terms of the modes of engagement and the audience groups being reached, which are geographically diverse and who are under-represented in chemistry.

The Outreach Fund has had significant impact and reach. The recommendations which follow focus on enhancing existing practices to further build on the positive experiences of grant holders and the influence the RSC has on chemistry engagement.

Recommendations

The recommendations below have been directly associated with the relevant <u>Outreach Fund aim</u>. Some recommendations are summarised and link back to the appropriate sections.

<u>Develop science communication skills of chemists – building capacity and opportunities for chemists and chemical scientists to engage with schools and public audiences</u> (sections 3.1 and 3.5.

- (A) The RSC should consider highlighting to applicants where the skills required for engagement and outreach contribute to the development of chemists.
- (B) Consider establishing more advice and support for applicants on how each partner/partner organisation might be expected to be impacted upon by an outreach fund grant.
- (M) Consider offering seed funding to support relationship development in order to allow applicants develop stronger more focused applications.
- (N) Facilitate opportunities for grant holders to form as a community.
- (O) Consider mechanisms for better connecting funded and/or potential projects with RSC members.

<u>Engage with school students – inspiring and raising aspirations of student audiences to nurture a future generation passionate about the chemical sciences</u> (section 3.2)

- (C) Use the Science Capital Teaching Approach (Goden et al. 2017), or another research-informed framework, when asking grant holders to describe the benefits of their project for school audiences at the application stage. The project can then be reviewed against these outcomes as part of the evaluation process.
- (D) Consider adding 'public audiences' to the Outreach Fund aim alongside school audiences.
- (E) Work with grant holders to communicate the successes of the projects using appropriate internal and external formats and channels. This includes but is not limited to effective practice and impact. The format and channels utilised should be proportionate and tailored to the desired audience and purpose.

<u>Provide under-represented audiences, communities and places with inspiring chemistry engagement opportunities, delivered or coordinated by skilled people</u> (section 3.3).

- (F) Provide short primer resources on topics of interest to the RSC, such as those currently considered to be key campaigns, to help applicants indicate if they feel their work is relevant to these areas.
- (G) Consider adding a reference to school <u>and</u> public audiences as part of this aim.

- (H) Identify ways in which grant holders can share their experiences of incorporating chemistry into their projects, this could be achieved through peer-to-peer networking sessions.
- (I) Collaborate and communicate with colleagues in other areas of working within the RSC, e.g. communications and education, to share project outcomes and impacts which are relevant .

Engage with public audiences – involving a wide range of people in relevant contemporary issues in the chemical sciences (section 3.4).

- (J) Highlight, informed by the available evidence, the groups that are under-represented within the chemistry community. Retain sufficient flexibility for organisations expert in working with under-represented audiences to apply their knowledge and experience in the shape, design and delivery of their projects.
- (K) Include a more detailed question about the audiences worked with and how they would be reached in both the application and final reporting forms.
- (L) Continue to fund a range of projects who do not explicitly reach under-represented audience groups ensuring a range of cultural and geographical spaces are served to ensure there is not the emergence of a chemistry gap.

We also recommend that the RSC strengthen fund data collection improving consistency across the application and evaluation process and the integration of closed questions to collect key indicators (See Appendix A).

We now go on to sum up the experiences of the grant holders.

4.2 Grant holder experience

Summary

In terms of the experiences of grant holders, the application and post-award processes are fit for purposes. Small changes could be made to expand guidance and improve feedback and reporting. There are benefits to grant holders by the scheme being run by the RSC. Grant holders valued the stamp of approval that being a RSC funding recipient afforded them, particularly with respect to their credibility as chemists, and the existing knowledge of the RSC within partner structures such as schools.

The current approach to application submission, review and support once awarded all seem sound, and have generated a wide array of successful projects, as well as a lot of learning in those who were less able to meet their original aims. The amount of work requested feels proportional to the funding amounts awarded, and the amounts awarded are generating significant work, reach and depth of engagement.

Relevant key findings in relation to the grant holder experience are that the funding has increased the quality of the funded projects (section 3.6). Here we also highlight that there have been a number of legacies beyond the funded period of the project, ranging from impacts on individual attitudes and practice through to influences on organisational strategy.

Recommendations

There are areas that could be improved. The most significant request from the grant holders was a way to connect to other projects and the learning from them, and this would seem useful not just for the projects, but also in generating better knowledge of the projects throughout the RSC. This has been highlighted as part of the recommendations in the previous section (Recommendation H). It should be noted that this will add to the grant holder experience but this will require resource, staff time, budget and support from other teams. Indeed, there may be further collaboration between RSC departments to support consistency between grant schemes, as some grant holders had experience of multiple schemes and their experience was different depending on the scheme. One option would be to consider funding one less project in order to start building the learning and sharing processes that might sustain and grow the impact of the scheme in the longer term. Any sharing process or event would need to also be proportional in time and resource required from the grant holders, and so expectations of what this might look like or produce need to take this into account. Additional reporting and evaluation is desirable, but should not come at the cost of the breadth of applicants or grant holders due to resourcing issues. Consideration should be given to how such work might be compensated or built-in to grants from the outset.

The following recommendations come from the discussion of the impact on quality and professionalism (section 3.6).

- (P) Continue to support the scheme with knowledgeable and engaged staff.
- (Q) Consider how support and advice could be offered either through the RSC, cohort support or provision within the award on traditional media and social media engagement.
- (R) Consider the improvements in practice (Table 8) in terms of a set of mini-recommendations (where not covered elsewhere), offering easy-win options for supporting applicants in future rounds.

This final set of recommendations for consideration are drawn from the discussion of legacies and unforeseen outcomes (section 3.7). Whilst these are not driven by the grant holder experience, they have the potential to affect their experience of the scheme in the future.

- (S) We would recommend establishing opportunities for longer term feedback to be shared with RSC staff or via an evaluation contractor, as this encouraged sharing that was not incorporated into the formalised reporting processes.
- (T) Add to the description of the Outreach Fund's aims in order to acknowledge that the fund is an enabling factor for a range of different legacies and longer term impacts.

- (U) Consider more open-ended ways of gathering information on legacy for example follow up interviews or workshops. E.g. rather than providing structured prompts on legacy, leave this more open to interpretation for grant holders.

Overall we have been very pleased to see such a range of projects, reaching so many different audiences with so many different chemistry topics. The connection to the humanity of the people involved, be that the chemists, the grant holders, or the participants and audiences, is to be commended, and has only been possible through the efforts of the scheme managers.

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Appendix A: Methodological-related data

Data categories

In terms of the analysis, the following key questions/fields were used from the data provided to us by the RSC in order to identify projects to approach for interview, quantify the reach of the Outreach Fund in section 1.2 and to illustrate other aspects throughout the analysis chapters. There were three key sources of information provided to us and each contained details on the 162 projects:

1. Applications-related data completed by the applicant.
2. Summary data compiled by the RSC for this review including tracking information about the award, e.g. feedback from panel on the award, date of award, etc.
3. Evaluation data provided by the grant holder following the completion of the project.

In general, **descriptive statistics** were used to provide a summary of the data. In many cases the open-ended data was coded into a set of categories (where this occurred, the questions have been marked with a * and for some questions the responses informed multiple aspects, e.g. number of engagements and engagement type). The majority of the questions were open-ended and those which were closed questions have been identified as such. There was some overlap between questions at the applications and evaluation phase, however there seemed to be changes in the categories used to describe audience groups.

The wording of the application forms and evaluation returns have changed in recent years.

Applications data:

Responses to the following questions were made available for the sample projects:

- Who is the target audience and what is the reach of the project? How many students, teachers and schools will you engage with during your project?

- Why is your project relevant to this audience? Please provide details as to how the audience of your project meets with the criteria of the Outreach Fund in no more than 300 words.

The current wording on the application form asks:

- Q14 Who is the main audience for your project?
  To support this selection there is space to provide a short summary of no more than a couple of sentences (you will be able to provide more detail further on your application) *
  Youth audience(s) in schools (e.g. age 18 or below)
  Youth audience(s) outside schools (e.g. age 18 or below)
  Families and/or adult audiences outside of school settings

- Q16 Please tell us how many people in each age category you hope to engage: *
  (These numbers should give an idea of the reach that you hope to achieve from your project):
- Q17 Describe the audience of your project.
  Please include any information on how your project is relevant to your target audience and how you have designed your project to meet these needs as well as any audience insights. This may include:
  Findings of any research/enquiries carried out that identifies/demonstrates the need of the audience for your activity
  The need of any relevant schools or groups for any funding being applied for (Maximum 200 words *).

Summary data from RSC:

- Grant round date: Month and year.

- Type of grant: public engagement or schools engagement.

- Size of grant: large or small.

- Location: region.

Evaluation data:

- How many people was the project delivered to (attended / visited)? And how did this compare with your original aims for the project? Please note, if your project aimed to reach under-represented audiences please include how it did or did not meet this objective.*

- Please note how you collected the information on how many people the project was delivered to as well as any further information in the evaluation of your audiences. This may include information relating to gender / age categories / postcode data.*

- Did you involve chemists in the development and delivery of your project? (closed question).
  - If yes please provide details of the chemists involved (and RSC members if relevant):

Reflexive thematic analysis was then used for the evaluation framework and the following fields/questions were used to make an assessment of the extent to which the Outreach Fund met its aims, identifying strengths and weaknesses and understanding the experiences of grant holders.

Applications data:

- Project summary.*
- Project description.*
- What area(s) or themes related to chemistry will your project include?
- You can use this space to provide further information that will support your application (only in 2020 form, not in 2021 forms onwards).
  Please tell us in no more than 300 words why you think your project is important, including any evidence about demand for the project in your area and the relevance of the project to your target audience. The panel will also look favorably at evidence that you have considered the legacy of your project and given due consideration to any future development and sustainability of the project beyond the grant period. It's particularly important that previously successful grant applicants use this space to detail the development of their activity in relation to the previously funded project.

Summary data from RSC:

- Panel feedback.

Evaluation data:

- Please describe to what extent your project met with the original aims and objectives: (max. 1000 words).
  - refer to those noted in the project summary and description of your application (we are able to provide this if you do not have a copy please email outreach@rsc.org)
  - did you engage with your intended target audience and was this an effective method to do so
  - if you were given specific feedback in your original grant award email that we wanted you to reflect upon please use this space to do so and highlight where necessary
- Please provide a few sentences indicating what went well with your project and what challenges you faced.
- Please describe the legacy of your project:
  - the impact that the project has had on your personal development

- partnerships that have developed as a result of the project and how they may continue
- resources that were created and how these will be shared
- the future of the project (funding and sustainability).

- Please describe the impact of receiving a grant from the RSC to support your project.

- Please provide any additional feedback on your experience of holding an RSC Outreach Fund grant. We consider all feedback and welcome any recommendations for improvements.

- Please mark the categories that best describe the audiences that participated in your project:
  - Families
  - Students in Primary education
  - Students in Secondary education
  - University students
  - Adults
  - Community groups
  - Mature students
  - Online/Social Media
  - Policy/Government
  - Underserved audiences (please specify e.g. disabled, BAME)

- Would your project have gone ahead without RSC funding? (closed question)
- Has your project been affected by the Covid-19 pandemic? (closed question)
- Please describe the impact the Covid-19 pandemic has had on your project.

Data collection recommendations

When considering what data and information to request from grant holders there are several key factors. It is important to gather sufficient information about each project in order to describe them and this is then supplemented by further information in order to assess whether the Outreach Fund's aims are being met. We have highlighted a list of questions from the evaluation requested at the end of the project which can be replaced. Suggestions are then made for those replacements, although the categories detailed in the closed-questions should be regularly reviewed as they will change and evolve depending on the awards being made. For example, in the sample considered as part of this report there is an increased number of online projects and this is likely to have dropped off in the most recent round of grant awards in terms of the overall proportion of grants awarded as more projects are returning to face to face delivery. Unfortunately there is not a standard practice for data collection in the public engagement and outreach sector. In addition to the following types of data, some organisations also ask for information on the depth of the engagement, e.g. the time spent interacting but this is not always relevant or practical, especially when considering online engagement with social media.

Current questions in the evaluation:

- Please mark the categories that best describe the audiences that participated in your project:
    - Families
    - Students in Primary education
    - Students in Secondary education
    - University students
    - Adults
    - Community groups
    - Mature students
    - Online/Social Media
    - Policy/Government
    - Underserved audiences (please specify e.g. disabled, BAME)
- How many people was the project delivered to (attended / visited)? And how did this compare with your original aims for the project? Please note, if your project aimed to reach under-represented audiences please include how it did or did not meet this objective.

- Please note how you collected the information on how many people the project was delivered to as well as any further information in the evaluation of your audiences. This may include information relating to gender / age categories / postcode data
- Please list the organisations/partners/schools you engaged with for this project:
  (if appropriate to your project please identify how these organisations/partners/schools fitted with the aims of your project e.g. location, demographics)
- Did you involve chemists in the development and delivery of your project?
  - If yes please provide details of the chemists involved (and RSC members if relevant):

Further questions on the details of the project, legacy, COVID and impact follow these.

Suggested replacement questions and categories:

Please note that there should be consistency between the applications questions/data categories and those asked at the post-project/evaluation stage.

- Interaction mode
  - In-person
  - Online
  - Mixture of in-person and online
- Audience type/age (*allow multiple responses to this question)*
  - 3 to 4 (Early years)
  - 5 to 7
  - 8 to 11
  - 12 to 14
  - 15 to 16
  - 17 to 18
  - Adults: FE or HE students
  - Adults: Teacher
  - Adults: Member of the public
  - Adults: policy or government
  - Group: community
  - Group: families
  - Other
- Interaction type
  - Workshop
  - CPD/Professional learning for teachers
  - Resource
  - Installation/display
  - Website
  - Social media
  - Video views
  - Conference
  - Other
- Interaction frequency
  - One-off
  - Repeat engagement

- Geographical reach
  - Scotland
  - Northern Ireland
  - Republic of Ireland
  - Wales
  - North East
  - North West
  - Yorkshire & Humber
  - Midlands
  - South East
  - South West
  - East
  - London
  - National
- Engagements
  - If in-person:
    - Number of participants
    - Postcode of the location of the activity
  - If online:
    - Video-based event:
      - Number of participants
      - Check box to indicate whether the participants watched a video or participated in a live session over Zoom or similar.
    - Website-based:
      - Number of unique website visitors
      - Number of pageviews
    - Social media-related:
      - Indicate the platform, e.g. Facebook/Instagram/TikTok.
      - Account followers.
      - Post engagement.
      - Post impressions.
    - Podcast:
      - Listeners/downloads
- Topic (*these are based on the RSC campaigns and can be amended as appropriate*)
  - Chemical waste and pollution
  - Discovery, research and innovation
  - Chemistry education
  - Environmental sustainability
  - Inclusion and diversity in the chemical sciences
  - Other (please describe)
- Did you work with an under-represented audience?
  - Yes
    - If yes, please describe as fully as possible. E.g. schools located in the 20% most deprived areas according to Indices of Multiple Deprivation.
  - No
- Any other audience insights available?
- Number of chemists involved
- Description of the role of any chemists involved
- Did you work with any partners to deliver the project?
  - Yes

- - If yes, who?
    - No
- Will this relationship continue beyond this project?
    - Yes
    - No
      Please explain your response.

Format of evaluation questions

Many of the evaluation questions were open-ended. Whilst this provides flexibility for projects to provide information on their activity, it makes it more challenging to easily track the numbers being engaged with as a result of funding and to summarise the types of audiences the Outreach Fund has reached. Therefore our recommendation is to replace the more open questions with clearer categories, as above.

We would also recommend a move away from the following example of wording to using more structured statements.

Please describe the legacy of your project:
- the impact that the project has had on your personal development
- partnerships that have developed as a result of the project and how they may continue
- resources that were created and how these will be shared

The evaluation framework, especially the evidence categories highlighted in Table 4 could be the basis of a set of statements with a likert scale. Example:

- Through their involvement in this project, chemists have developed their science communication skills.
  Strongly agree/Agree/Neutral/Disagree/Strongly disagree/Not applicable

There is of course a place for more open-ended questions, however these can be there to capture unexpected impacts and provide insight and context into key areas of feedback.

With regards to the supplementary files provided by projects at the evaluation stage, these varied broadly in terms of quality and type. Some projects seemed to provide raw data and evaluation tools, whilst others had detailed evaluation reports compiled by external evaluators. More guidance needs to be provided to projects in terms of what is suitable. One approach could be to set a reporting standard based on the level of award. For example, those in receipt of a grant of £5,000 or less are only expected to complete the RSC's evaluation form. Then for those who have received a larger award, a more detailed report outlining the impact of the project may be required. However, this decision is ultimately going to be about available resource within the RSC to review any additional documentation. We would recommend that the RSC discourage projects from sharing raw data without an accompanying analysis or commentary.

Interview schedule

Please note that the interviews were semi-structured therefore the questions were not read as if a script. Instead, the conversation was allowed to flow and questions would be asked out of order or in some cases later questions could be skipped over as they may have already been answered in an expanded answer to an earlier question.

1. Introduction: introduction to interviewer, the evaluation project, and the processes we'll be going through. Review consent.
2. To get us started, tell me a little about you project
   o What was your role in the project?
   o What organisations were involved? How did this project fit with their work?
3. What made you apply for RSC funding for this work?
   o Did the amounts make any difference?
   o Have you applied before?
   o Would you apply again?
4. How was your experience of applying for the funding?
   o Was the amount of work required proportionate to the funding you got?
   o Were you sure about how to report, and what might be useful?
5. One of the aspects of the RSC funding is the involvement of a Chemist. Can you tell me a little about your Chemist or the chemistry content of your project?
   o What links already existed?
   o What new work was needed to establish connection?
   o Do you think your project impacted on the Chemist at all? What makes you think that?
6. The aims of the outreach fund include to "engage with school students - inspiring and raising aspirations of student audiences to nurture a future generation passionate about the chemical sciences" or to "engage with public audiences - involving a wide range of people in relevant contemporary issues in the chemical sciences". Which of these were you aiming to address?
7. What chemistry topics did this include?
8. You mentioned you worked with [insert NAME OF AUDIENCE]. How did you choose this group to work with?
   o What links already existed?
   o What new work was needed to establish connection?
   o Do you consider this to be an under-represented audience? Tell me about why that is.
   o What sort of impact do you think your project had for that audience in the end?
   o Was that what you were aiming for?
   o How do you know that you had that impact?
9. How confident were you in evaluating your project? Did anything get in the way?
10. Finally, how important to you was it that your funding came from the RSC?
    o Did it make a difference to your project?
    o How was the relationship? Would you have liked anything different?
    o Have there been any longer lasting effects of holding this funding?
    o What would it mean if this funding no longer existed?
11. Anything else you would like to tell me?

Appendix B: Data summaries

Table 10. Geographical spread of projects

Region/Nation/City	Number of projects	Engagements	Interviewees
Scotland	17 (11%)	125263 (14%)	5
Northern Ireland	5 (3%)	5023 (1%)	-
Republic of Ireland	5 (3%)	5010 (1%)	3
Wales	14 (9%)	25199 (3%)	1
North East	11 (7%)	11973 (1%)	1
North West	12 (8%)	8195 (1%)	1
Yorkshire & Humber	6 (4%)	4449 (1%)	1
Midlands	25 (16%)	11803 (1%)	1
South East	22 (14%)	344338 (39%)	3
South West	14 (9%)	31975 (4%)	1
East	7 (5%)	29585 (3%)	-
London	14 (9%)	276944 (31%)	1

Table 11. Core audience of projects

Audience group	Number of projects	Engagements	Interviewees
Adult	15 (9%)	286555 (14.4%)	2
Adult and family	12 (7%)	134018 (6.74%)	N/A
Family	14 (9%)	111243 (5.59%)	3
Primary	40 (25%)	510635 (25.68%)	3
Primary and family	3 (2%)	1300 (0.07%)	
Primary and secondary	27 (17%)	296408 (14.9%)	4
Primary, secondary and family	2 (1%)	600000 (30.17%)	N/A
Secondary	45 (28%)	42897 (2.16%)	6
Secondary and adult	4 2%)	5677 (0.29%)	N/A

Table 12. Did projects work with an under-represented audience?

Under-represented audience?	Number of projects	Engagements	Interviewees
Yes	57 (35%)	1170401 (59%)	9
No	105 (65%)	818332 (41%)	9

Table 13. Engagement with audience groups based on whether project worked with under-represented group or not

| | Under-represented? | | | |
| | Yes | | No | |
Audience group	n	%	n	%
Primary and secondary and family	1	2%	1	1%
Primary	14	25%	26	25%
Primary and secondary	7	12%	20	19%
Adult	6	11%	9	9%
Family and adult	4	7%	8	8%
Family	7	12%	7	7%
Secondary	16	28%	29	28%
Secondary and adult	2	4%	2	2%
Primary and family	0	0%	3	3%
	57		105	

Table 14. Number and proportion of projects engaging with broad audience groups based, split by whether project worked with under-represented group or not

| | Under-represented? | | | |
| | Yes | | No | |
Audience group	n	%	n	%
Schools-related	40	70%	81	77%
Family and adult	4	7%	8	8%
Family	7	12%	7	7%
Adult	6	11%	9	9%
	57		105	

Table 15. Mode of engagement based on whether project worked with under-represented group or not

	Under-represented?			
	Yes		No	
	n	%	n	%
Digital resource	3	5%	3	3%
In-person engagement	30	53%	48	46%
Mixture of online and in-person engagement	5	9%	8	8%
Online engagement - live event	5	9%	11	10%
Online engagement - podcast downloads/listeners	5	9%	3	3%
Online engagement - video views	0	0%	8	8%
Online engagement - website	2	4%	5	5%
Online engagement - website and live events	0	0%	2	2%
Online engagement - website and social media	4	7%	4	4%
Remote learning (physical kit provided alongside online support, e.g. videos)	3	5%	13	12%
	57		105	

Table 16. Organisation type based on whether project worked with under-represented group or not

	Under-represented?				
	Yes		No		
Organisation type	n	%	n	%	Difference
University	19	33.3%	42	40.0%	6.7%
Education charity/social enterprise	12	21.1%	18	17.1%	-3.9%
Science centre/STEM engagement provider	9	15.8%	19	18.1%	2.3%
Cultural organisation	8	14.0%	10	9.5%	-4.5%
School	6	10.5%	12	11.4%	0.9%
Community charity	3	5.3%	4	3.8%	-1.5%
	57		105		

Table 17. Size of grant awarded

Size of grant	Number of projects	Engagements	Interviewees
Large	45 (28%)	575035 (29%)	10
Small	117 (72%)	1413698 (71%)	8

Table 18. Type of grant in terms of public engagement (PE) or school audience

PE or school	Number of projects	Engagements	Interviewees
PE	62 (38%)	1878769 (94%)	7
School	100 (62%)	109964 (6%)	11

Table 19. Distribution of grant awards by year

Year	Number of projects	Engagements	Interviewees
2020	78 (48.1%)	1351755 (68%)	6
2021	61 (37.7%)	619308 (31.1%)	8
2022	23 (14.2%)	17670 (0.9%)	6

Appendix C: Public engagement grant schemes

Table 20. UK-based STEM engagement funding schemes

Alan Turing Institute • AI and data science. • Up to £10,000. Total fund is £40,000. • Open to researchers eligible for ESRC funding.	• Expand and promote public understanding of AI and data science in society • Provide balanced, unbiased information in an accessible format, highlighting both the risks and benefits of AI and emerging technologies in society • Widen participation by inspiring members of the public that may not usually interact with science to take an interest and have a voice in AI and data science • Achieve clear and measurable impact
Anatomical Society • Anatomy of humans and animals. • Up to £500. 10 available per year. • Only open to AS members.	These grants aim to • Ignite curiosity in young and old audiences about the anatomy of humans and animals. • Stimulate Anatomists to share their stories, passion and expertise in innovative ways with wider audiences, particularly those that are traditionally hard to reach • Increase dialogue between researchers and the public, in particular on topics such as the animal research and the relevance of such research to health and medicine. • Support primary, secondary, and tertiary teaching through linking schools with academics experts • Stimulate an interest in Anatomy and Anatomy teaching
Biochemical Society • Molecular biosciences. • Two available: up to £1000 or up to £5000. • Open to applicants from any country.	The Biochemical Society supports public engagement and outreach activities that communicate the excitement of molecular bioscience to young people and the community. The types of projects that could be run with funding of up to £1000 include: • Re-using established activities/resources in a new context or with a new perspective. • Development of a new activity or resource for participants. • Inspiring workshops or lectures for students, teachers or communities. • Development of online content or activities that could be used to engage communities. • Community-led activities based on your research interests. The types of activities that could be funded with up to £5000 of grant funding include: • Development of a new activity or resource for groups of participants for sustained use. • Series of workshops or lectures for students, teachers or communities that involve continued engagement with participants.

	• Development of a new or expansion of an established engagement event, such as a science or community festival. Sustained community-led activities or engagement based on your research interests that will continue to engage the desired communities or groups.
British Academy • Humanities and social sciences. • Up to £8,000. • Only open to UK-based researchers.	The programme will: • Act as a catalyst to get a project or idea up and running. • Be an opportunity to try a new approach or work with a new audience to gain new perspectives on your research. • Offer the chance to build a new partnership with the cultural sector or try a new idea with an existing collaborator. The chance to work with a partner who truly adds value and makes a meaningful contribution to your project through their expertise, connections, skills or collections. • Allow you to make contacts and find networking opportunities with others in the research community who are interested in exploring new and innovative approaches to public engagement.
British Ecological Society • Ecological sciences. • Up to £2,000. • 'Lead applicant' should be a member.	All Grants must be for projects that meet at least one of the top-level BES aims: • Communicate evidence-based messaging for what ecology is, how nature works, and the use of ecological science as a solution to local and global challenges. • Raise awareness and public understanding of ecological careers, their relevance and importance, breadth, and diversity, and show that anybody can become an ecologist. • Share how individuals can take action to benefit the environment, themselves, and society. Increase the ability of others to deliver the above aims through outreach and engagement activities.
British Geophysical Association • Geophysics. • £2000 is full fund, aim to award multiple projects. • Anyone studying or working in the field of geophysics at a UK School, Higher education, Further education or research institution.	The British Geophysical Association (BGA) would like to invite applications for funding for public outreach activities to promote understanding of, and engagement with, any area of geophysics. Applications are open to anyone studying or working in the field of geophysics at a UK School, Higher education, Further education or research institution.
British Science Week • Science. • Two levels: up to £500 or up to £1000.	The events that we will prioritise for funding will fit strongly with our vision of a world where science is at the heart of culture and society. These include events that:

• Aimed at community groups.	• are embedded in your local community, where community members are involved in some aspect of the planning or delivery of the event • showcase the role science plays in everyday life, challenge the idea that science is separate from culture, and/or break down stereotypes of what it means to be a scientist or engage with science • leave a legacy, providing a way for those involved to continue their engagement with science.
British Society for the History of Science • History of Science. • Up to £500. • One of the applicants should be a member.	The British Society for the History of Science Outreach and Engagement Committee offers grants of up to £500 to support engagement and outreach projects in the history of science. We are keen to encourage projects that engage with the history of science, technology and medicine in new and exciting ways and are applicable to their intended audiences. For information on successful projects that have been supported by the OEC please see the 'recent activities' section of our website. Previous OEC Project Grant initiatives have included public events, the development of materials for schools, and work with collections and heritage sites. However, we are always hoping to be surprised by new ideas and formats. Please note that the OEC Project Grant is primarily intended as a seedcorn fund for new initiatives and to support small-scale projects or events. If your proposed project is part of a larger scheme of activity, please describe in your application what specific extras will be delivered by the funds from the OEC Project Grant.
British Society for Immunology • Immunology. • Up to £1,000. Total fund is £20,000. • One of the applicants should be a member.	The aims of the Communication & Engagement grants are to: • Spark interest in and conversation about immunology amongst a wide audience • Strengthen the understanding of immunology topics, helping the public make informed decisions about their health • Provide opportunities for BSI members to share their passion and knowledge, and build their confidence and skills in engagement • Improve trust in science and increase the impact of immunology research, demonstrating the contribution, benefit and influence on society beyond academia
Genetics Society • Genetics. • Two available: up to £1,000 and £1000 - £5,000. • Applicants should be a member.	Grants cover costs associated with public engagement activities relevant to Genetics. Information about prior grants awarded available here: https://genetics.org.uk/grants/eligibility/recently-funded-grant-applications/
IET & IMechE • Engineering.	The Engineering Education Grant Scheme (EEGS) helped to support UK-based educational projects which increased

• Fund closed in 2022.	engineering knowledge, improved wider engineering literacy and brought about a better understanding of the role of the engineer, and the contribution engineering makes to society, among young people aged 4-19.
Institute of Mathematics and its Applications • Mathematics. • Up to £600. • Applications are welcome from those working in secondary schools, colleges of further education (FE), and higher education institutions (HEI) (including PhD students).	The IMA offers an Education Grants Scheme to provide financial support towards the costs of running an educational activity relating to mathematics. The aim of the Education Grants Scheme is to enable organisations to pilot new ideas, approaches and practices or undertake collaborative activities that would not be possible under existing funding schemes.

Institute of Physics (IOP)
 • Physics.
 • £500 - £5,000.
 • "The scheme is open to individuals and organisations passionate about promoting engagement with physics."
	This Limit Less grant scheme supports projects that:
	 • Target the audiences prioritised by the IOP's Limit Less campaign – families with young people under the age of 16 that identify with one or more of the following groups:
	    o girls and young women;
	    o disabled young people;
	    o LGBT+ young people;
	    o young people from disadvantaged backgrounds; and
	    o Black Caribbean young people.
	 • Develop relationships between physics and public participants to grow beyond initial contact.
	 • Reinforce messages being delivered by existing engagement schemes by adapting to new locations, communities or circumstances.
	 • Build strong relationships between physics, physicists and diverse communities through co-developed and co-delivered engagement projects.

IOP Ireland • Physics. • €100-€1,000. • As IOP above but limited to organisations in Ireland and Northern Ireland.	The purpose of this grant scheme is to: • Raise public awareness of, and engagement with, contemporary physics • Inspire and enthuse public audiences, especially those not previously interested in physics • Reach young people in under-represented groups within physics (those who identify as girls/women, LGBT+, Black Caribbean, disabled, and from disadvantaged backgrounds) and their influencers beyond the classroom • Develop the science communication skills of physicists • Develop the science skills of communicators, artists, community organisers and cultural groups
IOP Scotland • Physics. • Up to £2,500.	Raise public awareness of, and engagement with, contemporary physics; • Inspire and enthuse public audiences, especially those not previously interested in physics

• As IOP above but limited to organisations in Scotland.	• Reach young people in under-represented groups and their influencers beyond the • classroom. • Develop the science communication skills of physicists • Develop the science skills of communicators, artists, community organisers and cultural groups
Microbiology Society • Microbiology. • Up to £1,000. • Applicants should be a member.	The grants "are available to support relevant science teaching or promotion initiatives, or to support developments likely to lead to an improvement in the teaching of any aspect of microbiology." Applications are reviewed against the following criteria: • The project is relevant to microbiology • The project has clear aims that are realistically achievable in the proposed time frame • The activity is clearly described and technically feasible • The project is innovative and/or timely • There is clear benefit to the target audience • The applicant, and any support staff, has the required expertise to support the project through to successful completion • The evaluation methods are adequately described and appropriate • The project has sustainability • Full and reasonable costings are given
Royal Academy of Engineering • Engineering. • £3,000 to £30,000. • "We welcome proposals from engineers, universities, science and engineering communicators and engagement professionals, colleges and schools."	The Ingenious awards programme aims to: • inspire creative public engagement with engineering projects • motivate engineers to share their stories, passion and expertise with wider audiences and develop their communication and engagement skills • raise awareness of the diversity, nature and impact of engineering among people of all ages and backgrounds • provide opportunities for engineers to engage with members of the public from groups currently underrepresented in engineering
Royal Astronomical Society • Astronomy and Geophysics. • Up to £5,000. • No stated eligibility criteria.	Successful applications will meet some, or all, of the following criteria: • Projects that promote greater interest in and understanding of astronomy or geophysics • Activities proven to interest the wider community and, in particular, young people in astronomy or geophysics • Projects that can be demonstrated to have a wide reach, impact and/or lasting legacy • Projects that are cost-effective • Projects that are innovative • Projects demonstrating matched funding, or support in kind, to cover some costs of the whole
Royal Society • Science.	The scheme is designed to support Society-funded scientists to undertake public engagement projects based

• £500 - £10,000 over two years. Max of £5,000 in one year. Total fund size is £60,000. • Limited to Royal Society-funded scientists.	on their research, and to increase the knowledge, skills and confidence of researchers. All funded projects should: • Be based on Royal Society-funded research • Involve scientists interacting with a public group outside your institution • Target specific audiences based on the aims and rationale of the project • Encourage open discussion between scientific researchers and your project's target audience • Aim to produce benefits for the public, the researcher and any partners or collaborators We are particularly interested in projects that: • Reach people that are currently underrepresented in the Society's public engagement work, including those without a science degree, those from geographically remote locations and those from culturally and demographically diverse backgrounds, including BAME and low-income backgrounds • Encourage collaboration between science and the arts • Enable possibilities for digital engagement, either as a main feature or as part of a contingency plan Whilst we welcome applications working with children and school groups, we would be particularly interested in projects that target wider age groups and demographics and collaborate with local creatives and organisations such as artists, writers, libraries and community organisations.
Royal Society of Biology • Biology. • Three available: £200, £201 - £500 and up to £1,000. • Limited to members but events can be run worldwide.	The aim of the grant scheme is to support outreach and engagement events and activities that are creative, impactful, and suited for audiences or based in locations that may have otherwise limited opportunities to engage with bioscience topics or concepts.
Royal Society of Chemistry Outreach Fund • Chemistry. • Two available: up to £5,000 or up to £10,000. • Aged 18 years and over and resident in the UK or Ireland.	• Develop science communication skills of chemists - building capacity and opportunities for chemists and chemical scientists to engage with schools and public audiences • Engage with school students - inspiring and raising aspirations of student audiences to nurture a future generation passionate about the chemical sciences • Engage with public audiences - involving a wide range of people in relevant contemporary issues in the chemical sciences • Provide under-represented audiences, communities and places with inspiring chemistry engagement opportunities, delivered or coordinated by skilled people

There are of course a number of schemes of funding available via the National Lottery but these are not dedicated outreach and public engagement funds (National Lottery 2023). Larger scale schemes, such as the STFC Nucleus and Spark awards and the UK Space Agency's Space for All grants have not been considered in this review as they make awards of six figures over multiple years.