THE ROYAL SOCIETY

How can we improve air quality in our local area?

1. Project overview

Duration of project
3 terms minimum to cover seasonal variation. Easily repeatable year-on-year
Can be considered as part of the Tomorrow's Climate scientists programme

Through this project students will be able to investigate the air quality found throughout their school grounds. They will discover and gain a greater understanding of how to measure and understand air quality data at a statistical level, learning also about the effects of air quality on plant and lichen growth. Working with their STEM partner, the students will be able to explore different ways to improve air quality, implementing and evaluating ideas based on psychological messaging and communicating their findings with the wider school community. Linking strongly to the geography curriculum, this project will enable teachers to inspire the next generation of human geographers and ensure students are confident with data and statistical analysis. Details of the investigative work required to support this project can be found in section 4.

2. Student involvement

This project is aimed at secondary school students aged between 16 – 18, however, it could be adapted to suit other age groups and abilities. This project can be adapted to suit large groups, from clubs to whole year groups or larger, and we encourage projects to be as inclusive as possible. The project can be used to engage a wide variety of students in the school. For example:

1) older students mentoring younger years to engage with the observation and monitoring sections of the investigation
2) students with an interest in art and design helping to communicate the findings of the project to the wider school community via media such as video, posters etc.

3. STEM Partner involvement

Funding will only be offered to schools that can demonstrate a strong partnership. The partnership can either be with one individual STEM partner or a team of STEM partners. If there is a team of STEM partners, one must be identified as the lead STEM partner for the application process and must have sustained and meaningful engagement (in-person or online) with the students and teacher throughout the duration of the project. Other STEM partners in the team can support the project, if needed, to provide specialist knowledge or to help spread the time commitment and ensure the students have regular STEM partner engagement. For a year-long project such as described here, we would expect a ***minimum of 10 in-person visits over the course of the project***, undertaken by any of the STEM partners involved. The STEM partner(s) will provide the students with relevant guidance and knowledge to help them with their investigations, as well as an insight into potential careers.

The main role of the STEM partner(s) is to support the planning, design and implementation of the investigation that the students will carry out. Examples of how the STEM partner(s) could support the implementation of the investigations include (but are not limited to):

- supporting students to form their own hypotheses
- supporting students to set up their investigations following the scientific method
- helping provide secondary research sources and support the understanding of technical information
- helping with data collection and identification

- helping the development and implementation of student plans to improve air quality
- helping with any building or design elements

Other activities that the STEM partner(s) could get involved with are:

- arranging a visit to their place of work
- providing an introductory talk to the project group, or whole school, regarding their career and the relevance of this to the project being undertaken; and
- supporting the students end of project presentations.

Examples of STEM partners that could support this project are university or industry-based researchers, with a degree or equivalent background in a subject such as environmental science, chemistry, mathematics or physics. Professionals who are working in environmental or social psychology, environmental planning or council environment managers.

For more information about the STEM partner eligibility requirements and guidance on how to find a STEM partner, please read the What is the partnership page on our website.

4. Investigation options

The following investigations described in the plan below will underpin this project and help the students answer the project title question. Please note some of the investigations may need to take place in parallel rather than sequentially throughout the year. The individual investigations suggested may need to be adapted or altered, dependant on the school grounds and areas available locally. Teachers can also add in additional investigations and other project elements as required.

Project plan	Equipment suggestions
Initial survey and baseline data collection: Using measuring devices and visual observations, determine areas within and around the school where students pass through or congregate with low air quality. Postulate theories as to the cause of low air quality areas.	Air quality monitor units (wearable/portable, although static versions could be used and moved from space to space)
Secondary research: Carry out secondary research to find any existing information on the effectiveness of psychologically derived messaging to reduce engine idling, and also the effects of pedestrianisation (in terms or air quality, but also people movement). Find out about the ethics to be considered when designing psychological interventions, and the effects of poor air quality on things such as plant and lichen growth.	
Main Investigation: 1. Based on the secondary research and baseline observations, design an intervention based on psychological messaging (signs) that can be implemented and tested against a control area (blank signs).	Planning application costs for temporary signage (if not on schools grounds) Printing costs for signs

Make predictions on what might be observed before undertaking data collection to see if the results confirm or disprove the predictions. Collate and review data using statistical analysis to look at driver behaviour (number of cars, idling times etc) and air quality (CO_2, particle data plant or lichen life/growth) before, during and after the intervention, as well as in the control area. 2. Repeat the driver behaviour and particle data collection at different times of the year to see if temperature and weather conditions affect air quality and driver behaviour. Do people drive as much in warmer weather, does poor air quality improve as quickly in still conditions compared to windy? 3. Identify pedestrianised areas (either within/near to the school or within the town/city), and similar areas that are not pedestrianised. Measure the air quality and visitor behaviour within the areas to determine if pedestrianisation is effective at reducing air pollution and increasing trade or if it has limitations as an intervention.	Weather station (could use online data for area)
Wider communication: Communicate the results to the wider school community; methods could include information leaflets/posters, school assemblies, getting other years practically involved in the project, or a short film.	Please note: additional film grants towards a camera / software / microphones etc. are available to Partnership Grant holders.

A suggestion of essential equipment and supplies needed to undertake each of the parts of the project has been listed to assist you when putting together your budget. Please also consider any relevant additional costs permitted within the scheme, such as teacher cover, essential teacher CPD and/or travel costs for project related visits. For more guidance, please read the eligibility and judging criteria page on our website.

5. Benefits and skills

Involvement in a long-term investigative project should enable students to have an in-depth experience of working scientifically as well as developing their general team working and communication skills.

Through this project the students will specifically learn about how to measure and improve air quality around their school (and local area), gaining detailed knowledge about how peoples' behaviour and weather conditions can affect air quality as well as a broader understanding of the effect poor air quality has on plan and lichen growth. They will learn skills in research, observation and monitoring, data capture, data analysis and problem solving. Dependant on the exact investigations and activities you propose to undertake, there may be additional benefits and skills you can identify in your application.

6. Legacy activities

It is important that Partnership Grant projects are sustainable, providing long-term benefits to your students and wider school community in terms of the teaching and learning of STEM subjects.
Your legacy activities could include (but are not limited to):

- repeating the project with successive year groups
- re-using the equipment to test other interventions to improve air quality or to gather evidence on the long-term impact of the student's psychological interventions
- Investigate different areas of the school or local area
- expanding the project to include other schools in the area, loaning out the monitoring equipment to collate more evidence to compare with your own.

7. Next steps

1 - Securing your STEM partner

Using the information about STEM partners above, search for universities and businesses within reasonable travelling distance to you that might have suitable contacts to approach. A good route to finding these contacts is often your own school's Governors and student's parents, another is the national STEM Ambassador scheme. Once you have a few contacts in mind, write an email/letter inviting them to be involved in the project, providing clear and concise information about areas you need support with, the time commitment you are expecting, and the duration of the project. If you need further advice as to how to find a STEM partner, please contact the Schools Engagement team directly via education@royalsociety.org .

2 - How to start an application

This project is ideally started in the autumn term to allow the project to run the full academic year. To get the funding secured and paid in time, you will need to submit the full grant application for the April deadline in the academic year before. An example timeline is given below, and more information about The application process and timelines can be found on our website.

You can access the application form via the Royal Society's grant management system called Flexi Grant: https://grants.royalsociety.org/. When you first create your log-in and access Flexi Grant several grants will be visible on the screen. Please make sure you choose the ***Partnership Grants stage 1*** form to start.

3 - Where to get more information

You can find full information about the Partnership Grants scheme, including eligibility and judging criteria, application guidance and exemplar forms via our website: www.royalsociety.org/partnership

If you have specific questions about your project idea, STEM partner or application, please either attend one of our online training sessions or please contact the Schools Engagement team directly via education@royalsociety.org .