

**BRONZE
LEVEL**



Resource pack for teachers and students

DROPLET DETECTIVES

Designing the blueprint for healthier buildings



COLLECTION



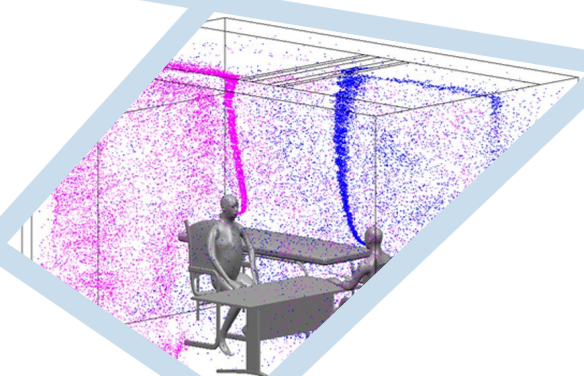
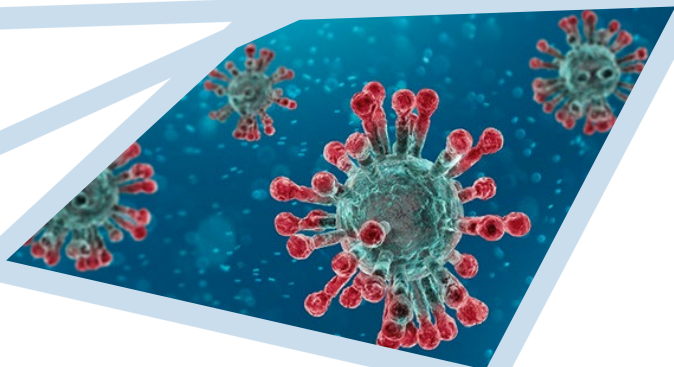
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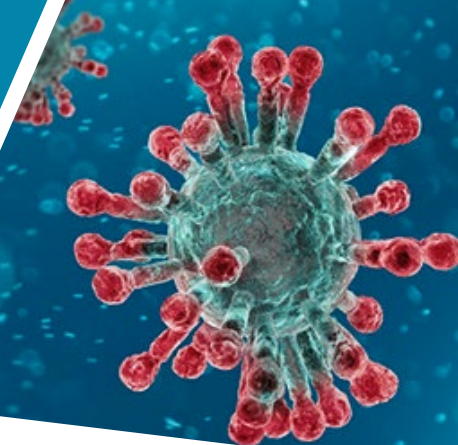
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How to run CREST using these activities



Preparation

Ready to get going with CREST? Prepare to submit for your students' Awards by signing up for a CREST account [here](#).

Create a new Bronze Award project with the name(s) of the student(s) and the title of their project. If you don't have all the details, you can fill these in later.

Run the project

We have some super handy [workbooks](#) and [profiles](#) for your student(s) to use when running a CREST Award. The profile is ideal for students who need less support, while the workbook provides some scaffolding to walk students through the project.

Encourage your student(s) to use the workbook or profile to plan and carry out their project, keeping a record of all their amazing progress. Students only need to complete one. Make sure you consider safety and risks.

There is also a handy [teacher guide](#).

Reflection

Once your student(s) have completed their CREST project, don't let that be the end of their learning. They should now fill in any remaining sections of their workbook or profile. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

Enter your project for a CREST Bronze Award

Hard work deserves a reward! Celebrate and certify your student's achievements by submitting their project for a CREST Bronze Award. Simply log in to your [CREST account](#), select the project and upload a sample of the students' workbooks or profiles, or other project evidence. Check the participating students have met each of the criteria on the teacher assessment page. Finally, complete the delivery and payment details to order your snazzy certificates. Congratulations on completing CREST Bronze!

What next?

The scientific discovery doesn't need to end here. Students can have a go at the next level up – [CREST Silver](#). Don't keep all the fun to yourselves, encourage others to take part in [CREST projects](#) and share the wonder of science!



Find a mentor by contacting your local [STEM Ambassador](#) hub

Project background



Project background

Many universities in the UK conduct research projects to advance scientific knowledge to help develop solutions to complex public health problems.

This CREST Award project has arisen from a partnership between the British Science Association, University College London (UCL) and University College London Hospitals (UCLH).

The partnership enables young people to learn about careers in research and the role of science, technology and engineering to develop solutions to real-life problems.

Through the work of UCL's [Air Safety Programme](#) research team, who are investigating ways to reduce the spread of airborne infections in hospitals, students will gain valuable insight into the role of health research to improve scientific knowledge and to reduce infection rates in healthcare settings.

Whilst the context for UCL's programme is hospital based, this Bronze CREST Award enables students to use their knowledge and skills to apply their research to a setting of their choice.

University College London

University College London (UCL) is one of the world's top universities, with broad disciplinary excellence in research, innovation, education and impact.



University College London Hospitals

UCLH (University College London Hospitals NHS Foundation Trust), situated in the heart of London, is one of the largest NHS trusts in the United Kingdom and provides first-class acute and specialist services.



University College London Hospitals
NHS Foundation Trust

The work of the research team is also funded and supported by:

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Instructions for teachers



Context: Droplet Detectives

The context of aerosol droplets links to University College London's [Air Safety Programme](#) research. It provides great opportunities for students to learn from an authentic health science project whilst shaping their own investigation.

In this pack

This pack contains guidance for teachers and students on how to run and investigate two Bronze Award project briefs. Both briefs enable students to investigate how science research and technology have a place in developing solutions to reduce the spread of airborne infections in public buildings and spaces.

If you have a student(s) who wants to adapt the brief based on the context of airborne infection that is also fine. Please ensure that if they do so, the project enables them to meet the [CREST Bronze Award criteria](#).

Supporting students to complete their project

Each project should involve approximately 10 hours of student work from start to finish. The project should be led by the student(s). As a teacher or mentor your role is to:

- Act as a sounding board for students' ideas and nurture the students' work;
- Check your students' project plans before they begin the next stage;
- Help students see mistakes and setbacks as an opportunity for positive learning and lateral thinking (leading to creativity);
- Where relevant, support students to access professionals or experts who could support them;
- Provide access to the Internet, library books and magazines;
- Help students to complete their project and record their findings;
- Encourage them to reflect on their own performance and learning.

Use the tips on page 12 to help students complete their CREST Bronze project report.

Health and safety

Students should be encouraged to make their own risk assessment before they carry out any activity, including surveys. They can also use the [CLEAPSS student safety sheets](#) to help them.

They should write out their project plan, identifying the risks involved in each stage and the control measures and precautions they will take. In all circumstances this must be checked by a competent person.

Students using specialised equipment should always be supervised. Students may want to set up unorthodox experiments, and you may need to seek specialist advice. Contact [CLEAPSS](#) directly for advice if you are unsure. Teachers in Scotland should refer to [SSERC](#).

Teacher guide

Droplet Detectives project

brief 1: Building Design



Use the Droplet Detectives PowerPoint (PPT) presentation slides 3-17 to introduce the context of UCL's [Air Safety Programme project](#). Use the video clip and comic strip on PPT slides 4 and 5 to prompt discussion about their own recollection of places (in addition to hospitals) that were affected by COVID.

You'll find prompt questions on many of the PPT slides. Use these prompts to extend discussion and set the scene for their own project.

Project brief 1: Building Design

Use PPT slide 19 to share the Building Design brief.

Many of our public buildings such as schools and libraries were not designed to reduce the spread of airborne infections such as COVID. Now that we have more information about how airborne infections spread, use your skills to either:

- *Redesign the interior space of a building of your choice to reduce the spread of airborne infection.*
- *Design a new public building (such as a school, sports centre or library) that includes design features and technology that reduce the spread of airborne infection.*

This architecture-based project might well suit a student who enjoys designing and making projects as it provides opportunity for design-based work and 3D modelling.

Helping students to get started

- Explain that they will be working on their project for 10 hours and how to complete the [workbook](#) or [profile form](#).
- Discuss how you will support them but that the project also encourages independent work.
- Use PPT slide 20 to discuss the different tasks that need completing and what they might want to consider before starting the project.
- Share the Droplet Detectives: Building Design student guide on pages 7-8 to prompt project planning.

Prompt questions

Buildings – How will you go about selecting a building to design or re-design?

Hotspots – How will you gain permission to carry out research on a building? How can you find out the number of daily visitors? Think about how people will use the building and likely hotspots.

Design features – How can you find out which design features and technologies, such as ventilation systems, screen barriers and managing people's journeys, help to reduce infection spread?

Building design – What tools can help you to design your building? Will you draw by hand or on a computer?

Presenting your recommended design – What is the best way to present your ideas to persuade the building's management to refit or rebuild the building to reduce infection?

Teamwork: If working in a group, how will you work as a team to divide up the tasks?

Useful website links

[What are airborne diseases?](#)

Student guide

Droplet Detectives project

brief 1: Building Design



Project brief – Building Design

Many of our public buildings such as schools and libraries were not designed to manage the spread of airborne infections such as COVID -19.

Now that we have more information about how airborne infections spread, use your skills to either;

- Redesign the interior space of a building of your choice to reduce the spread of airborne infection or;
- Design a new public building (such as a school or sports centre) that includes design features and technology that help to reduce the spread of airborne infection.

Getting started

- Select a building or space of your choice that you would like to design or re-design.
- Think about how people will use the building and likely hotspots.
- Investigate which building design features such as ventilation systems, screen barriers and managing people's journeys through the building can help to reduce the spread of airborne infections.
- Design your building with features to reduce the spread of airborne infection. This is such a big topic to explore that there's a *Building Design: considerations* sheet to support your research.

Things to consider

- Do you have access to design software to help you design your building or would you prefer hand drawings?
- Presentation – what is the best way to present your building design ideas to a management team?

Useful research links

[What are airborne diseases?](#)

[Infection control in the built environment](#)

Health and safety

To avoid any accidents, make sure you stick to the following health and safety guidelines before getting started:

- Find out if any of the materials, equipment or methods are hazardous using [CLEAPSS Student Safety Sheets](#).
- Decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on).
- Make sure there is plenty of space to work.
- Make sure your teacher agrees with your plan and risk assessment.

Student Guide

Building Design: considerations



There are many things to consider when designing or re-designing a building to reduce the spread of infection.

Here are some key things for you to consider:

Ventilation and air quality

- Use natural ventilation (windows, vents) where possible.
- Install mechanical ventilation systems with filters

Touch-free technology

- Automatic doors, sensor taps, and touchless soap dispensers reduce contact points.
- Consider voice-activated controls or foot pedals in high-use areas.

Surface materials

- Use antimicrobial surfaces in high-touch zones.
- Choose easy-to-clean materials for floors, desks, and handles.

Layout and flow

- Design wide corridors and one-way systems to reduce crowding.
- Include clear signage to guide movement and reduce confusion.

Hand washing stations

- Place sanitiser dispensers at entrances and exits
- Ensure sinks are accessible

Lighting and visibility

- Use natural light to support health and reduce reliance on shared switches.
- Ensure good visibility and cleaning.

Cleaning

- Design spaces to be easy to clean

Outdoor learning and break areas

- Encourage use of outdoor spaces for lessons, breaks, and meals.

After you have looked through the design features, decide which ones are possible for your building.

Which design features might schools find challenging when trying to make these changes?

In addition to building design features, what else could you do to encourage people to remember to protect themselves from the spread of infection in your building?

Teacher guide

Droplet Detectives project brief 2: Tech Solutions



Use the Droplet Detectives PowerPoint (PPT) presentation slides 3-17 to introduce the context of UCL's [Air Safety Programme](#) project. Use the video clip and comic strip on PPT slides 4 and 5 to prompt discussion about their own recollection of places (in addition to hospitals) that were affected by COVID.

You'll find prompt questions on many of the PPT slides. Use these prompts to extend discussion and set the scene for their own project.

Project brief 2: Tech Solutions

Use PPT slide 21 to present the Tech Solutions project brief.

Airborne infections that spread in hospitals, also spread in schools and other public places such as in cafes, sports centres, shops, libraries and on public transport.

Your project is to investigate which technologies and/or other measures should be put in place to reduce the spread of airborne infections in a building or place of your choice.

This project might be suitable for students interested in science and engineering. Their investigation focuses on the use and efficacy of technical solutions such as air filters, ventilation systems and screening to reduce the spread of airborne infections.

It also provides the opportunity for students to transfer their understanding from UCL's research to a more familiar building of interest. This could be their school, college or a building in the local environment.

Helping students to get started

- Explain that they will be working on their project for 10 hours and how to complete the [workbook](#) or [profile](#) form.
- Discuss how you will support them but that the project also encourages independent work.
- Use PPT slide 22 to discuss the different tasks that need completing and how they might plan to organise their investigation depending on whether they are working on their own or in a group.

Prompts

- **Buildings:** Which building would you like to base your investigation on? Is the building easy for you to visit to assess potential for use of different technical solutions?
- **Hotspots:** What is the best way to find out about possible infection hotspots in the building? How can you collate data to help your investigation?
- **Technical solutions:** What technical solutions already exist to reduce the spread of airborne infections? How do they work? What are the pros and cons of the different technologies such as air filters, ventilation systems and screen barriers?
- **Presentation or report?** What is the best way to persuade the building's management team to invest in a new tech solution? Where should it be positioned within your building and why.
- **Teamwork:** If working in a group, how will you work as a team to divide up the tasks?

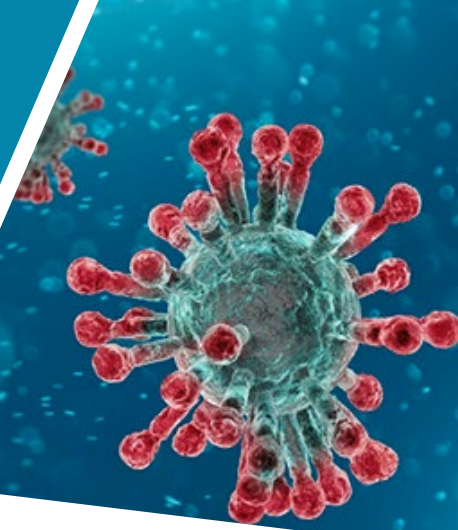
Useful website links

[What are airborne diseases?](#)

[How do air filters work?](#)

Student guide

Droplet Detectives project brief 2: Tech Solutions



Project brief – Tech Solutions

Airborne infections that spread in hospitals, also spread in schools and other public places such as in cafes, sports centres, shops, libraries and on public transport.

Your project is to investigate which technologies and/or other measures should be put in place to reduce the spread of airborne infections in a building or place of your choice.

Getting started

- Select a building or space of your choice to investigate.
- Carry out research into the likely number of visitors to the building and possible infection hotspots.
- Investigate which technologies or products offer the best solutions to reduce the spread of airborne infections in your setting. You can choose to investigate one or more engineering-based options. They could include air filters, ventilation systems and screen barriers.
- Consider your criteria for evaluating products and technologies. Check out the helpful tips sheet on the next page.
- Prepare a presentation or report to give to the building's management team. It should include which technical solutions you recommend, where they should be positioned within your building and why.

Things to consider

Choice of building – which building will you be able to easily access? Will you need permission to carry out research there?

Technologies to investigate – how can you access an air filter or other product? If you can't find the tech, how can you investigate it?

Presenting your project – what is the best way to present your research to convince the building manager to invest.

Useful research links

[What are airborne diseases?](#)

[How do air filters work?](#)

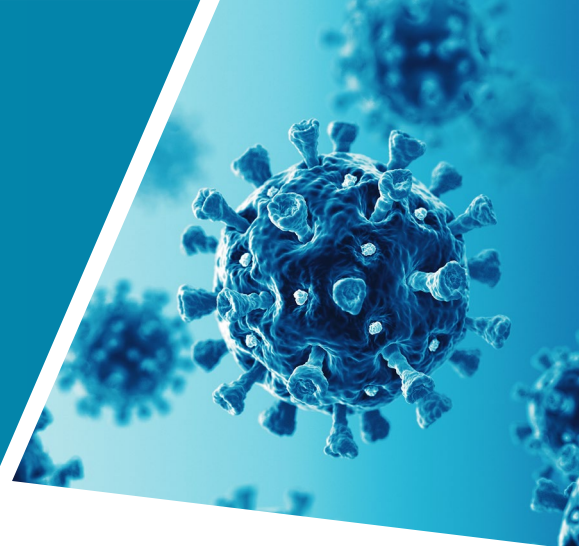
Health and safety

To avoid any accidents, make sure you stick to the following health and safety guidelines before getting started:

- Find out if any of the materials, equipment or methods are hazardous using [CLEAPSS Student Safety Sheets](#).
- Decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on).
- Make sure there is plenty of space to work.
- Clear up slip or trip hazards promptly.
- Make sure your teacher agrees with your plan and risk assessment.

Student guide

Tech Solutions: evaluation tips



Evaluation Tips

To help evaluate tech solutions that reduce the spread of infection, you will need to consider the criteria you use to make your judgement.

Your evaluation criteria could include consideration of the technology or products.

Effectiveness

- Does it reduce the spread of germs, viruses, or bacteria?
- Is there scientific evidence or testing to support its claims?
- Does it reduce infection risk immediately or over time?

Safety

- Is it safe for children, staff, and visitors?

Ease of use

- Can people use it easily without special training?
- Can everyone use it, including people with disabilities?
- Does it work in different types of buildings or classrooms?
- Does it work automatically or need regular attention?

Cost

- Is it affordable for schools or public buildings?
- Are there hidden costs (e.g. maintenance, replacement parts)?

Environmental impact

- Is it energy-efficient or eco-friendly?
- Does it produce waste ?

Maintenance

- How often does it need to be cleaned, repaired, or replaced?

User experience

- Is it comfortable to be around (e.g. not noisy, smelly, or distracting)?
- Do people feel safer and more confident using it?

Which are the most important criteria for you to consider when evaluating the suitability of the tech for your building?

When you have finalised your evaluation criteria, you can start to evaluate.

Criteria	Rating (1-5)	Notes / Examples
Effectiveness		
Safety		
Ease of use		
Cost		
Environmental impact		
Maintenance		
User experience		

If you do not have access to the products or technology, you might need to carry out online research. Most products will have technical, safety and use information.

If you are comparing products such as different types of air filters, then you can rate them against your evaluation criteria.

Rate each category from 1 (poor) to 5 (excellent). Add notes or examples to support your rating.

TOP TIPS

for completing a Bronze project

1. Understand the problem

Find out more about UCL's [Air Safety Programme](#), then make sure you are clear about the problem you need to solve and the time you have. If you are developing your own project idea, discuss your ideas with your teacher or mentor.

2. Plan your approach

Draw or write a plan showing how you will approach the problem, the tasks you will complete, the resources you'll need and how long you will spend on each task. Ask your teacher or mentor for feedback on your plan.

3. Watch out!

Identify any risks to health and safety or ethical concerns you think there will be. Decide how you will limit or overcome these risks. Show your risk assessment to your teacher.

4. Research

Find a professional mentor

Find out more by doing some research using the suggested links on the project page.

Research relevant news articles, blog posts and other media sources.

5. Use your research to improve your plan and generate ideas

Use your research to help you produce a possible solution or to select the best experiments to use in your practical work.

6. Finalise your idea and carry out practical work

Carry out any practical work including experiments, surveys, or designing and making activities. When testing your ideas, make sure you make it a fair test and record all your results clearly. You could also use photos and a diary to record your project activities.

7. Concluding your project

What have you found out by doing your project?

Did you come across any problems, how did you overcome them?

What is the impact of your project for other people, how could it be developed further?

Has it changed how you feel about infection control?

8. Choose the best way to communicate it

Tell others about what you did. You could use a written report, a digital presentation, a blog or a poster display. Make sure you include each stage from planning through to the conclusion.

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