



Lesson plans: Air quality experiments

Detailed below are two options for lessons to look at air quality locally. These have been developed for Key Stage 2 pupils, but could work well with the lesson plans provided for KS1 or reception.

Experiment Option One: Lichen Mapping

Class time required: 15 minutes

Fieldwork time required: 40 minutes

Time until results: Immediate

Cost: none

Experiment Option Two: Air Quality Wipes

Time required: 20 minutes

Time until results: Two weeks

Cost: Around £5

Curriculum Links

Science: Planning scientific enquiries of different types to answer questions

Science: Recognising when and how to set up comparative and fair tests and explaining which variables need to be controlled and why

Science: Taking measurements using a range of scientific equipment

Geography: Using fieldwork and observational skills to study the key human and physical features of their school, home and local environment

You Will Need

- Pens or pencils
- Whiteboard and marker
- Internet access (for viewing images)
- For Experiment One: Lichen identification guide, downloadable here: <https://www.opalexplornature.org/airsurvey> This resource also has a Survey Booklet to download that can give additional support around lichen mapping if required.
- For Experiment Two: Laminated copies of worksheet one, wet wipes (biodegradable preferred) and sandwich bags
- Risk assessments for fieldwork

Time Requirement

Each experiment takes between one and two lessons of 50 minutes, including work in class and out in the field. Experiments take between two weeks to complete for the Air Quality Wipes.

Experiment Option One: Lichen Mapping

Opener: Nitrogen Dioxide and Lichen (5 mins)

- Ask your class to think back to the first lesson on air quality, or use the materials provided in the other lesson plans to give an introduction to air quality. What do they remember about the air we breathe and pollutants? Can they remember any of the types of pollution? Remind them about nitrogen dioxide, which comes from car exhausts, burning fuel in power plants, cigarettes and thunderstorms.

- Tell your class that, in Europe, the amount of nitrogen dioxide (NO₂) in our air is supposed to be very small: just 40 micrograms per cubic metre, which is about 0.000003%. However, NO₂ levels in cities are often above the legal limit.

- There are lots of different ways of measuring this type of pollution, such as special tubes or digital sensors. However, there is another, natural way of finding clues about nitrogen dioxide levels: looking for lichen.

- You may want to spend more time in a separate lesson planning the experiment, using maps of the local area, and considering how to plan a fair experiment

Fieldwork: Looking for Lichen (35 mins)

- Have any of your pupils heard of lichens? They are a type of organism that can be found on trees. Lichen is made up of fungus and algae living in close partnership - a relationship that scientists call symbiosis. Lichens can tell us a lot about the environments they live in. Certain types of lichen are easily harmed by pollution, some thrive in a polluted environment, and some are happiest in the middle. By identifying and mapping different species we can find out about local pollution.

- Tell your class that they will be going out into the school grounds to search trees and twigs for lichens that will give us clues about pollution.

- Opal Explore Nature have an excellent lichen guide for your fieldwork here: <https://www.opalexplornature.org/airsurvey>

- Using the booklet, lichen guide, tree guide and a tape measure, your pupils can explore the school ground and record examples of lichens they find on different types of trees and twigs.

Close: Lichen Mapping (10 mins)

- Once your class have found and recorded four examples of lichen on trees and four examples of lichen on twigs, head back into the classroom.

- Enter the results onto the Opal Explore Nature website: www.tinyurl.com/LichenResults.

- Once you have entered your results you will be able to explore the results of other communities and compare pollution levels locally and at sites across the UK.

- If you wish, you can encourage your pupils to carry out this survey at home with their families as homework. This works well in conjunction with the Air Quality Wipe Test in the next experiment.

Experiment Option Two: Air Quality Wipes

- This experiment works well as a classroom stretch activity if a group of pupils are particularly engaged, or as homework.
- It gives visual evidence of “dirty” air quality areas.
- You’ll need to laminate copies of Worksheet 1: Air Quality Signs (see below) and cut out the central “window” after lamination.
- You’ll also need to provide wet wipes and sandwich bags.

Opener: Air quality wipe experiment (15 mins)

- Ask your class to think back to the first lesson on air quality, or use the materials provided in the other lesson plans to give an introduction to air quality. What do they remember about the air we breathe and pollutants? Can they remember any of the types of pollution? Remind them about nitrogen dioxide, which comes from car exhausts, burning fuel in power plants, cigarettes and thunderstorms.
- We can’t see many of the pollutants in the air, but this experiment is going to show us some of those we can, known as particulates. Particulates come in all sizes, and the bigger ones can be detected in this experiment.
- Particulates can be harmful to our health, particularly for our breathing when they are present in higher levels.

Fieldwork: Air Quality Wipes (35 mins)

- Ask your pupils to stick the laminated copies of Worksheet 1: Air Quality Signs (see below) on four external windows. Encourage your pupils to choose a variety of places where they have permission to place the Worksheets; for example at home, or at school. The test sheet must be left in place for two weeks.
- After two weeks, clean the inside of the “window” with a wet wipe in an up and down direction. Record the location and start/end dates of the experiment, then place the wipe in a labelled sandwich bag.
- Once all the sites have been “cleaned”, your pupils should make a visual display of the wipes. The picture below shows how this might look.

Interpretation and Close

Consider if the results match the pupils’ expectations, or if you have done the lichen experiment, how do the two compare?

Ask the following questions on the white board and brainstorm responses from the pupils:

- What can we do?
- Who should we tell?
- What should our school do?

Air Quality Wipe Experiment Results



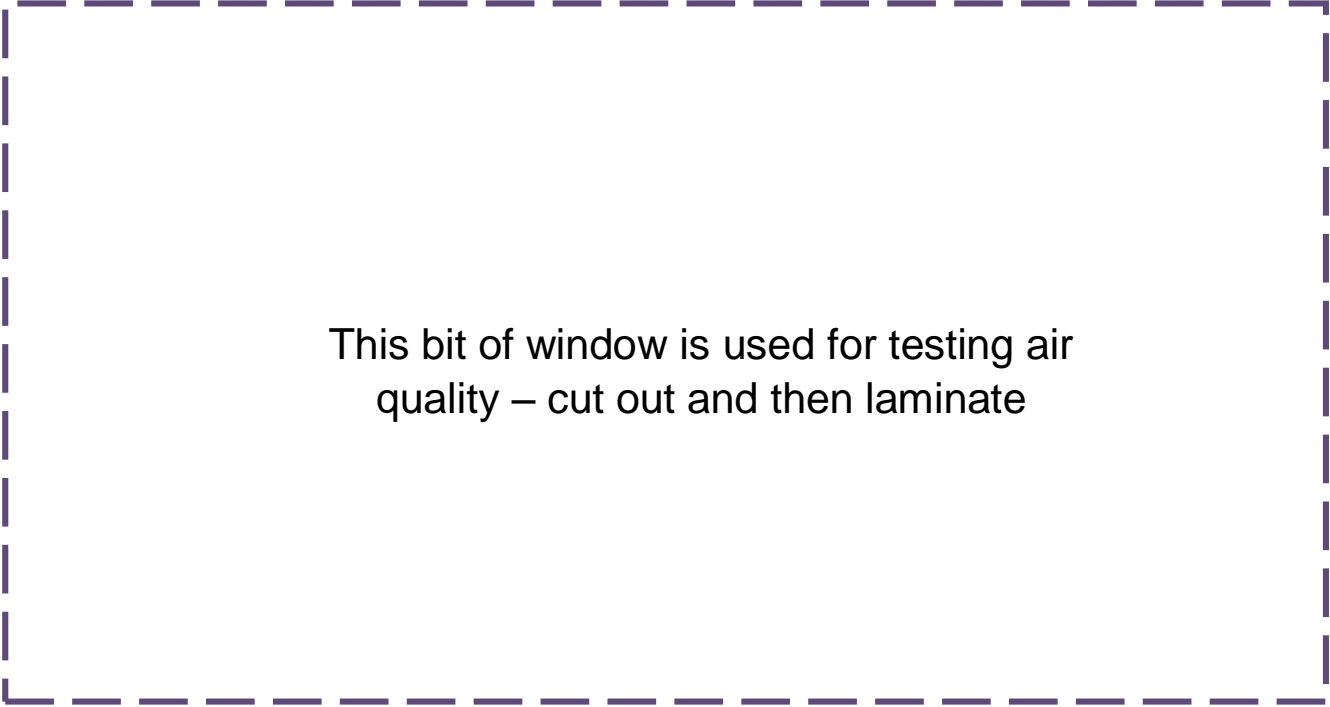
Most polluted

Least Polluted

Clean Wipe Home School Bus Stop Main road

Worksheet 1: Air quality monitoring window

Please do not touch it or clean it. Thank you!



This bit of window is used for testing air
quality – cut out and then laminate