Trial to determine IAQ in a Bristol primary school

Summer Term 2024

Beam Group + Butterfly + Cathedral Schools Trust

March 2025

Executive Summary

Problem

Since the launch of the Bristol Clean air zone, the Victoria Park primary school community has observed an increase in traffic on the main road outside. Concerns were raised by parents and staff over the potential impact on Indoor Air Quality (IAQ) in classrooms , particularly following extra traffic being routed away from the clean air zone and towards the school.

Solution

Butterfly monitors were installed in several locations to capture IAQ data including CO2, PM, VOC, Temperature and Humidity over an initial 2-week period commencing 9th March. Thereafter Beam Group installed several air purifier units featuring HEPA silent filtration technology which remove 99.97% of particles to deliver protection against virus and bacteria, Butterfly was then able to show improvements to IAQ via an IOT link.

Pupil Participation

As part of this initiative ‘ The Green Team’ was formed from a cross section of pupils who were asked to complete a survey showing IAQ **before and after** installation of the Butterfly monitors & purification units, demonstrating a potential solution for parental concerns.

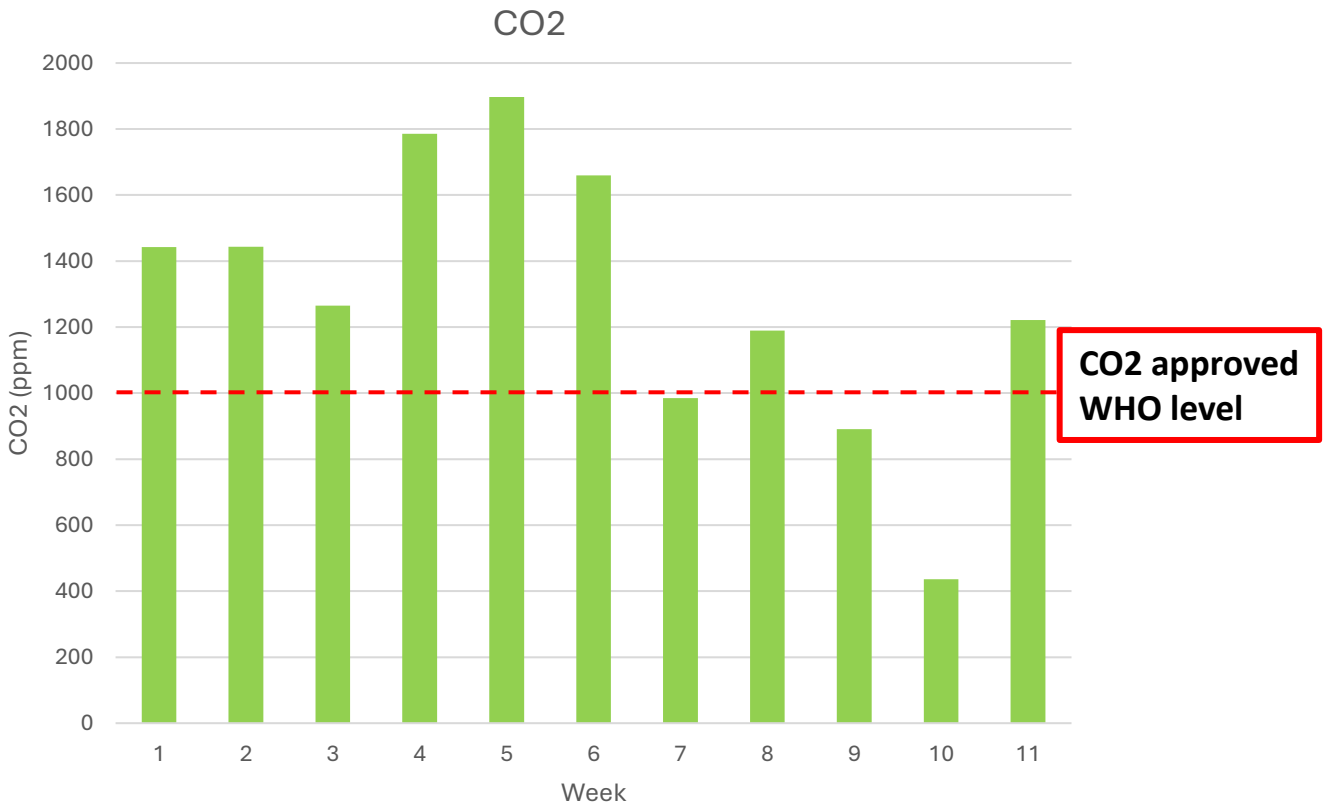
Carbon Dioxide (CO2)

Butterfly reported that CO2 levels were consistently higher than WHO approved level of 1000 ppm for the first few weeks of the trial

This is undoubtedly due to full classroom occupancy whilst the windows remained closed through a period when temperature was between 10-15C.

As temperatures rose in weeks 8 and 9 peaking towards 25C the windows were opened and CO2 reduced markedly.

As a useful benchmark, CO2 is lowest at approximately around 400ppm during the week 10 half term when the school was closed and no pupils were attending class.



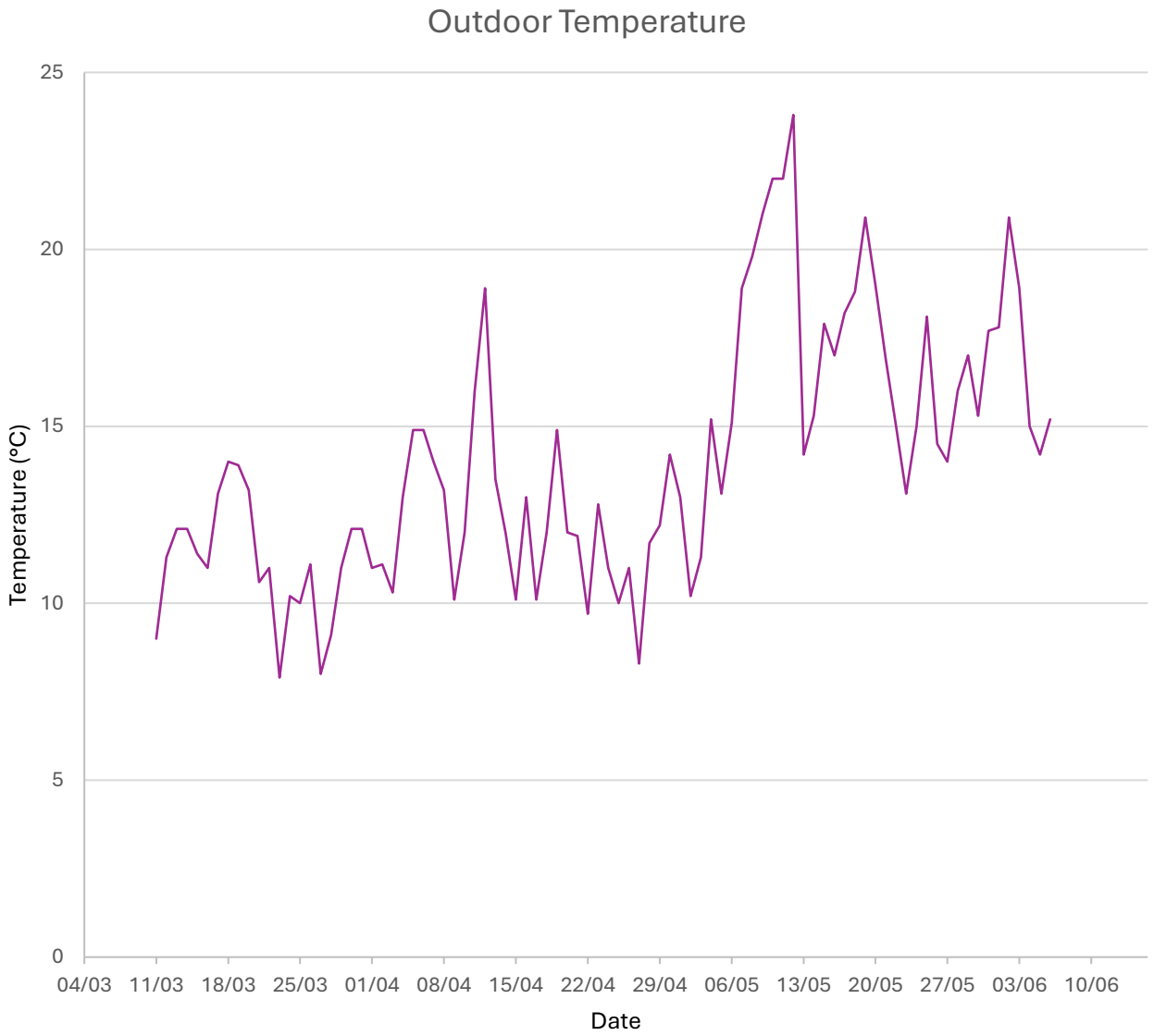
Temperature

Throughout the trial Butterfly kept close watch on Temperature.

This was important because unlike IAQ parameters people ‘feel’ temperature and change their behaviour and surroundings accordingly.

In the classroom this meant that whereas windows were kept closed through the first few weeks of the trial when temperatures were between 10-15°C, by weeks 8 and 9 temperatures were peaking towards 25°C and the windows were opened.

This had an immediate and measurable effect on PM which Butterfly was simultaneously tracking.



Particulate Matter (PM)

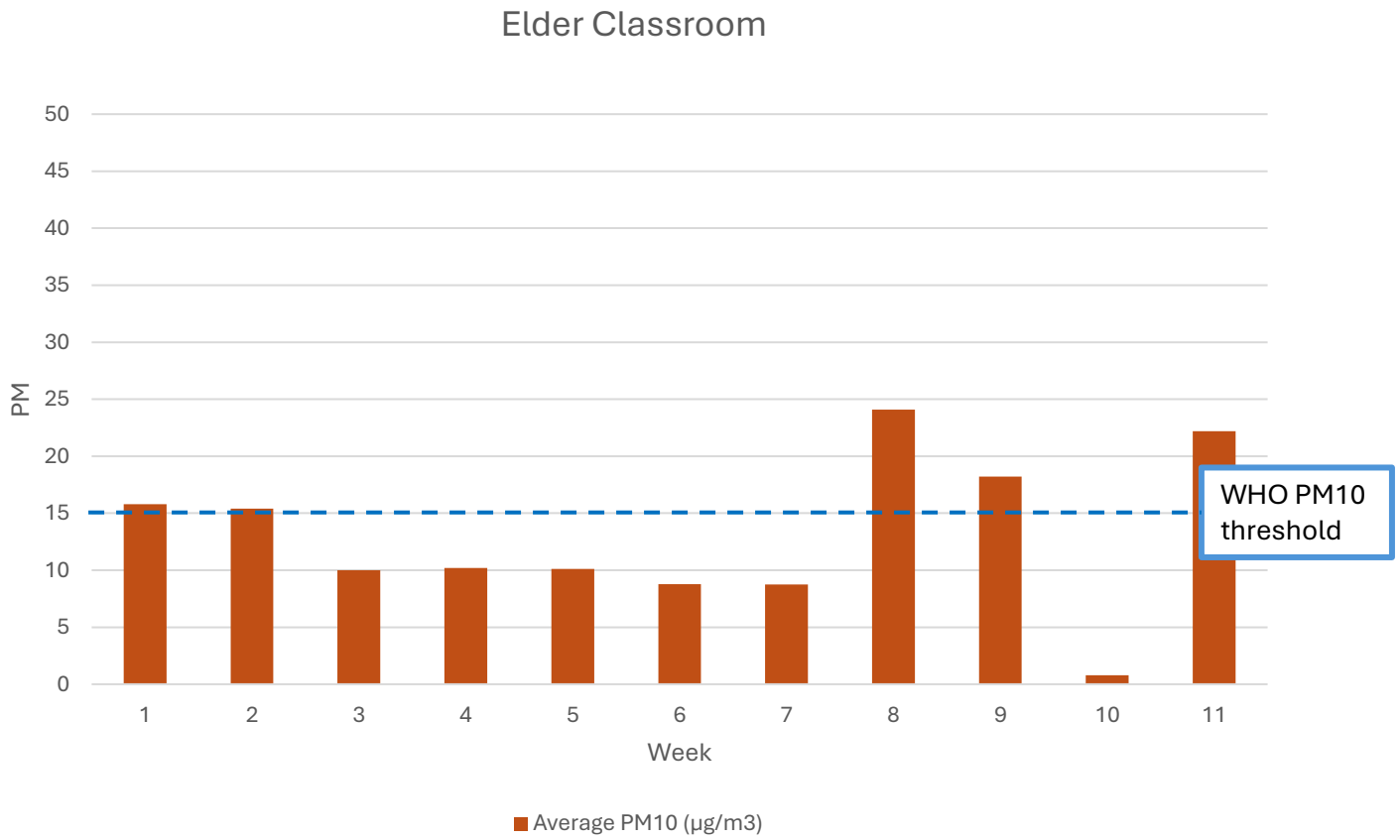
During the initial 2 weeks of the trial period Butterfly reported PM levels in the classroom exceeding 15 mg/m3 which i.e. well beyond WHO guidelines.

Purifiers were introduced by BEAM at the beginning of the 3rd week and Butterfly reported a marked reduction in PM to levels below 10mg/m3 i.e approximately 30% less PM which is well within WHO guidelines.

This is a significant result which indicates an effective potential strategy for improving health in the classroom.

In the subsequent weeks, the weather became warmer and windows were opened to keep classroom temperatures cool resulting in PM increases due to polluted outside air flowing inside, but the purifiers continued to operate and Butterfly data from other spaces in the school indicated that Elder classroom experienced less of a spike than elsewhere.

As a useful comparison, week 10 was half term when the school was closed, parents were not driving pupils to school, no windows were open and Butterfly reported very low levels of PM.



Attendance

Pupil from Oak Classroom:

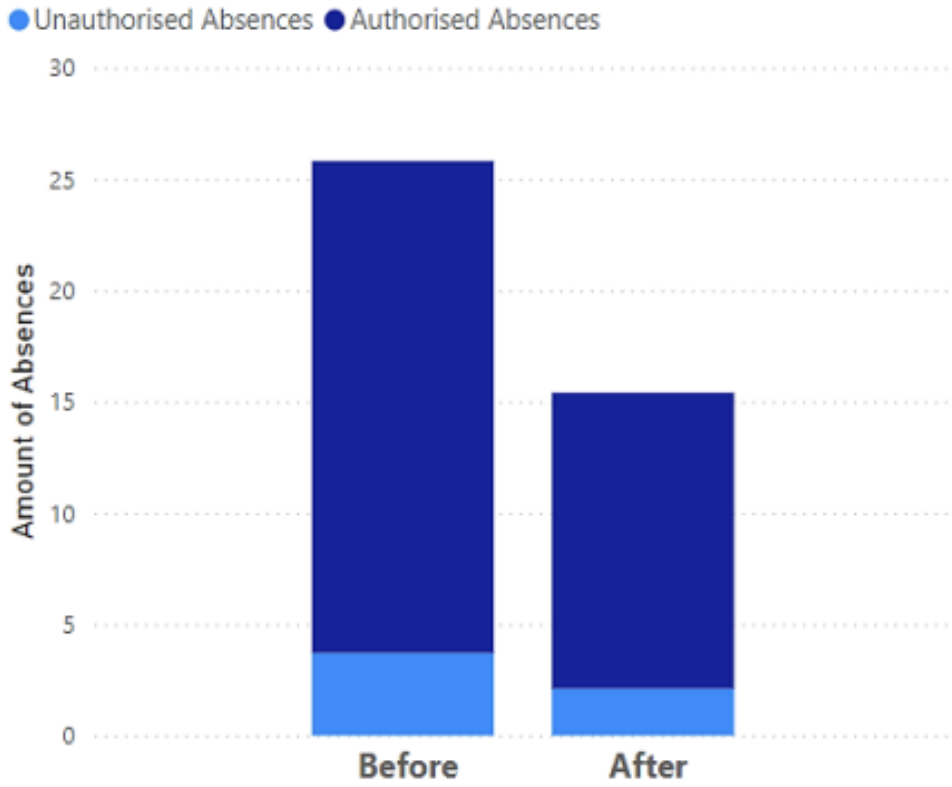
“ I think it’s good to have Butterfly because it lets us know if we need to keep the windows open and if the air isn’t very good”

Pupil from Cherry Classroom:

“ Butterfly helps a lot because you then feel that you are awake and ready to learn”

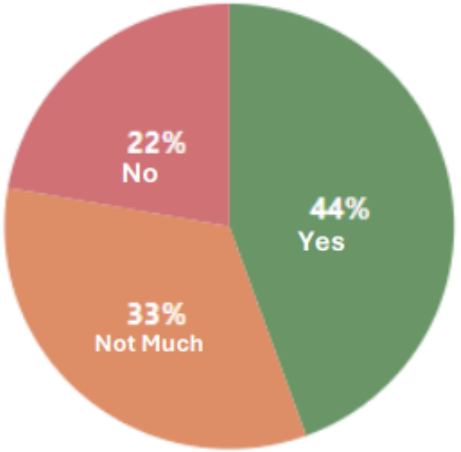
Year 1 Class Teacher and Sustainability Lead:

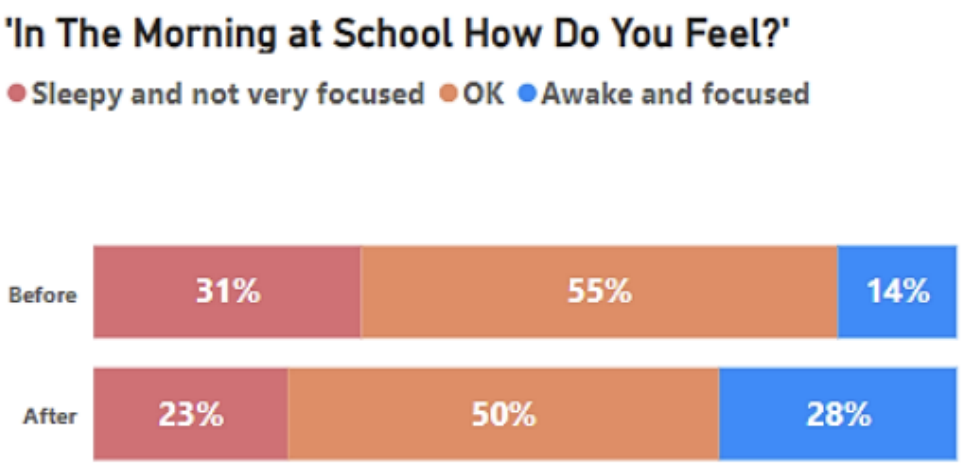
“ It was great to have a visual for the air quality and Buterfly did raise awareness of the ‘invisible’ around us in the classes where they were used – a really engaging tool which the children loved and were curious about. It did help staff monitor air quality and open doors & windows which must have been beneficial to learning as it would have reduced CO2 levels”

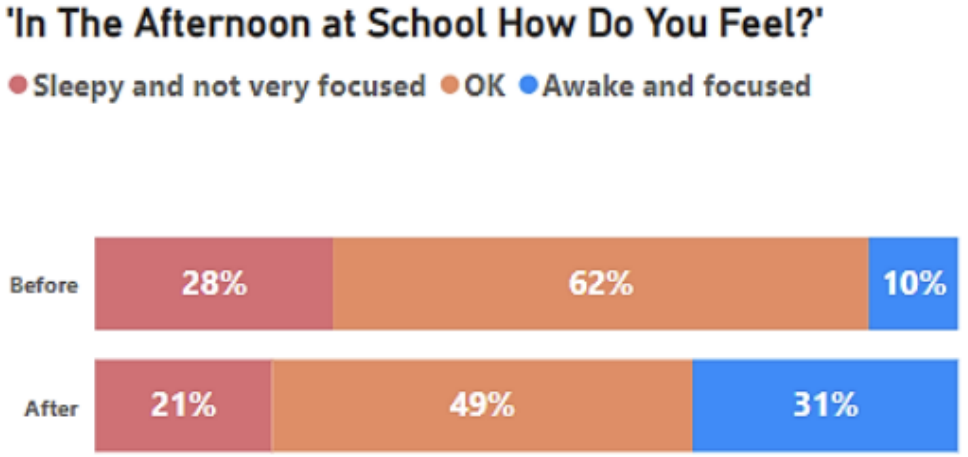


Feedback

Have you noticed any difference in your classroom air quality?







Results

By introducing Butterfly devices and providing data to establish indoor air quality & thereafter purification units we were able to:

- **Contribute to reducing absenteeism by nearly 40%**
- **Considerably improve how awake & focused the students felt during the day**
- **Raise awareness & understanding of the effects of poor air quality by engaging the students with our intuitive devices**
- **Reassure Parents that measures can be taken to improve pupil health in school and influence external behavior such as walking to school rather than driving**
- **Demonstrate as a matter of fact that increasing ventilation will suppress CO2 but at the same time increase PM in the classroom, pointing to the need for balanced ventilation with purification to deliver optimal IAQ for pupils during term time**

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Thankyou

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Contact: nick@butterfly-air.com