Everything matters and together they matter still more…

The pandemic has focussed many facility users on the impact of COVID aerosol dangers, with a global mantra of ventilate and mask. English schools are being issued with cheap CO2 monitors and CO2ppm is seen as a proxy for COVID virus aerosol droplets - both are relatively heavy.

But the physical spaces we work in turn out to be substantially more complex than that.

With a team drawn largely from English researchers we have been analysing those working / learning environments for over half a decade and are sitting on millions of hours of data from education, health, sport and homes.

It is a sobering picture.

We have been looking in particular at conditions which enable us to be our best selves - sharper cognition, focussed attention, memory and engagement at their best.

That is a complex mix and we have metered temperature, light levels with light quality, TVOCs (those volatile organic compounds that you smell after glueing, or cleaning), CO2, humidity, sound, and PM2.5 (for example the little Particulate Matter specs of soot from diesel exhausts).

Each of these variables impact on our cognitive processes and more. The individual impacts are well documented in published research, but are not much heeded.

If you look at the dispensing counter in most pharmacies it is typically badly lit and poorly ventilated; mistakes will be made in those sub optimal conditions.

Anywhere that we need to be our best selves, we need the room around us to help not hinder that ambition.

Visiting a brand new MRI facility recently, the darkest part of the whole new installation was the reception and admin area.

Errors will result.

In schools we can map across a classroom, or exam room, and see where the bright eyed bushy tailed pupils will be sitting and where the distracted kids with ebbing attention will be.

Swap their seating over and its clear that attention can often be deficited by environment.

When we swapped over the contrasting corners of a classroom in a little coastal primary school, a girl from the ventilated, bright, cool corner, transplanted into a warm, dark CO2 rich, formerly distracted corner, commented within an hour that:

"*I can feel myself going over to the dark side*"!

Academic results can be substantially higher where the room environment is right.

Try explaining the injustice of that to a parent. This extends to adults too, of course.

Our work with elite level athletes showed that changing the coaching room details helped them to retain their complex set-piece

choreography, with a better chance of medals resulting.

The interrelationships are complex: this is a textbook example of the aggregation of marginal gains; everything matters and together they matter still more.

What is less clear is the impact of the interrelationship between those variables.

By way of illustrating that complexity, take a working space with CO2 levels that are too high.

A small, plant-wall will reduce those levels, via photosynthesis, very quickly, but opening doors and windows will also make a rapid difference (although windows alone won't much refresh the bottom half of the room).

However, if the window or door opens onto a busy road, then as the CO2 exits, the damaging PM2.5 diesel soot particles enter.

And outside dust will additionally lead to a changed cleaning regime.

We have seen alarmingly high peaks in TVOCs resulting directly from aggressive COVID cleaning.

Surfaces are cleaned but the users of the space are, so-to-speak, brainwashed, too.

Similarly, temperature is optimal around the 18°C - 21°C range, with an impact on calculating prowess that shows it declining above that level in a straight line.

But 3D printers function best in warmer rooms that keep the filament pliable.

At temperatures of 28°C the 3D printer is fine, but the solvents in the carpet tiles start to leech into the room with significant impact.

Everything is interlinked. In Health these variables impact everywhere and on everything from our own learning and meeting spaces to post recovery ward accident rates.

Anywhere that we need to be our best selves, we need the room around us to help not hinder that ambition.

Visiting a high level decision making team earlier this year the team leader confided that;

"*Nobody stays here for long, it's been months since we had a really good idea and no one wants to come to meetings*".

A glance at the data from our little analytic box and we could all see why…

… maybe we should be focussing our research on improving things in Whitehall?

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