A waste of space?

Does the airiness of your classroom, or the way you arrange your desks, have a significant impact on learning? **Irena Barker** explores the research on how the teaching environment impacts the amount children learn, and uncovers some surprising findings

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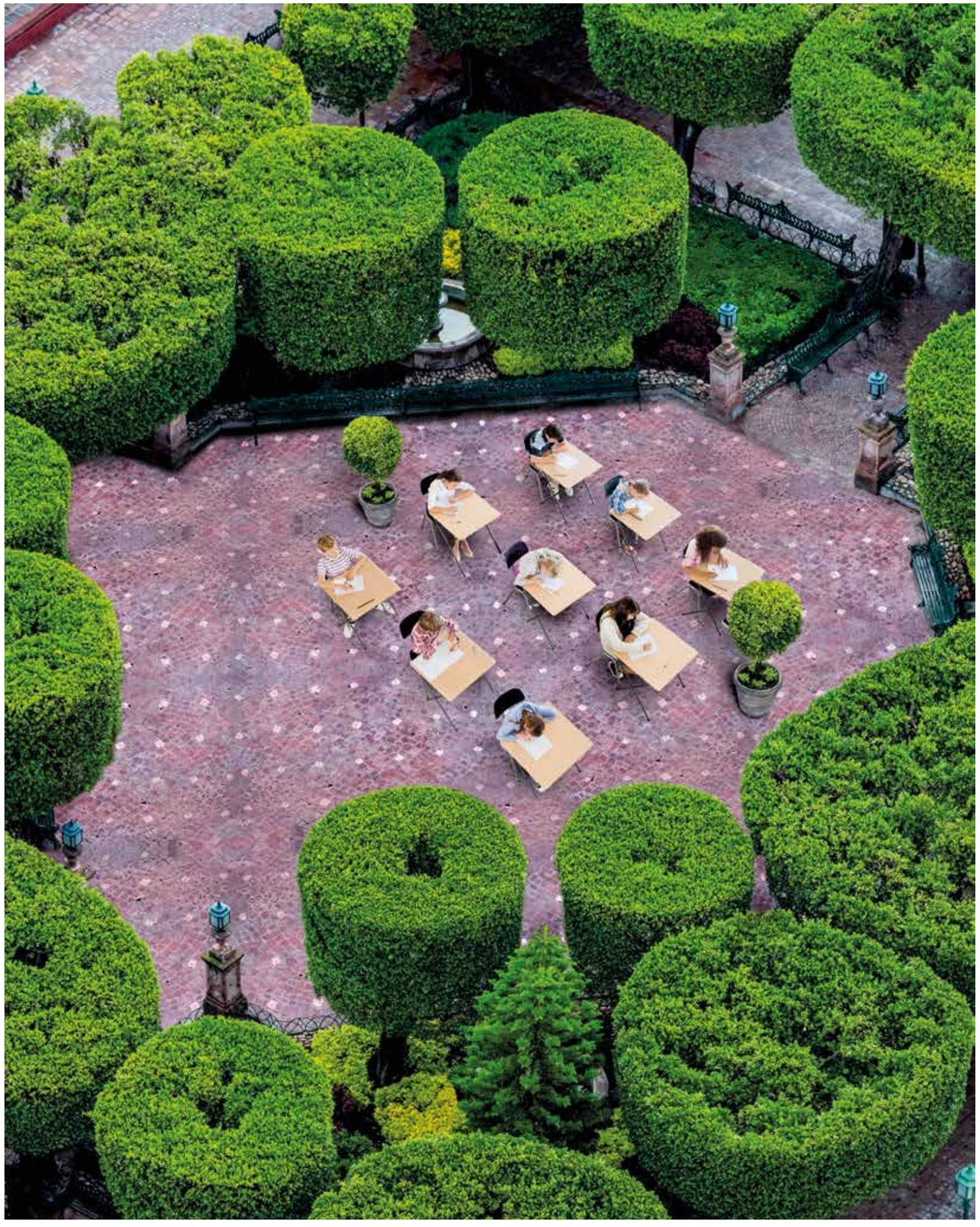

The Prince of Wales School, a primary in Dorchester, Dorset, is not housed in an enormous warehouse. Neither does it have a huge car park outside. And there is definitely no deli counter.

But, according to headteacher Gary Spracklen, the school's recent classroom renovations, embarked upon to boost learning, were partly inspired by supermarket giant Tesco. Looking around, it's hard to see how.

The eureka moment, he explains, was not suddenly seeing the educational potential of an in-school bakery or a coffee shop, but learning how much effort the supermarket puts into designing its stores to influence what – and how much – customers buy.

"For me, it was like the penny dropped," Spracklen says. "If we can do that for shopping habits, maximising the impact in a very limited time, why could we not do that in the spaces where we sit our children for six hours every day?"

For any school asking itself this question, the first obstacle is money. Those in schools tend to have to bend to the building, rather than being able to bend the building to their needs. Schools usually work with the premises they inherit and there is seldom a budget for substantial renovations.

Another issue is a lack of research. Millions of pounds have been spent looking at how environment can influence individuals throughout a shopping experience. But there is nowhere near as much money splashing around for research into the effect of school environments on learning.

The light fantastic

However, that is not to say there is no potential for making physical changes: some schools do find the cash and are innovative with it. And, likewise, a good number of studies have been carried out into the kind of environmental changes that might improve pupil outcomes.

But is there enough decent research to help staff make decisions and to use as a basis for a renovation programme?

The research is strong in some areas, and less so in others.

Of course, all the research has to be considered with an awareness that isolating variables and determining cause and effect in the complex world of a school is hugely difficult. However, let's push the door ajar all the same, take a look inside, and see whether what we find is of use.

The most extensive and convincing research so far has been into so-called "comfort factors" in classrooms, such as temperature, light and air. For example, most teachers will be familiar with the effects of stiflingly hot classrooms, but their pleas that the heat impacts performance are not always taken seriously. Yet a 2018 analysis of the test scores of 10 million US teenagers across 13 years found that they were more likely to have lower marks in hotter years and better marks in cooler ones.

The study, released by the National Bureau for Economic Research, showed that each 0.55°C increase above 21°C in school-year average outside temperature resulted in a 1 per cent drop in the amount learned that year, with the negative effect accelerating once temperatures increased above 32°C (see bit.ly/ClassHeat).

But stuffy classrooms with high concentrations of CO_2 can be just as damaging as overheated ones, apparently. A UK study of 332 Year 5 children in eight schools revealed that those taught in better ventilated classrooms with lower concentrations of CO_2 did better in each of nine on-screen tests designed to check their reaction times and concentration skills (see bit.ly/ClassCarbon).

The size of the negative effect of bad ventilation was "even higher for tasks that require more complex skills such as spatial working memory and verbal ability to recognise words and non-words," a 2012 report of the study said.

Natural light in classrooms also seems to be key. In 1999, the US architectural consultants Heschong Mahone Group concluded, after an extensive study of three elementary-level school districts across three states, that students progressed faster in maths and reading according to the greater access they had to natural light in their classrooms (see bit.ly/ClassLight).

In one of the three school districts covered, students in classrooms with the most daylight progressed 20 per cent faster in maths and 26 per cent faster in reading than those with the least, controlling for other factors.

The report also cited a Swedish study in which correlations were found between daylight levels and more positive behaviour.

While the evidence for each of these three environmental aspects should be considered carefully, it would make intuitive sense that lighter, airier classrooms would be beneficial to those trying to learn.

But what about other very basic elements of classroom design and set-up – the sticky debates around how we arrange the desks, for example? A 2008 review of eight research studies into this by Rachel Wannarka and Kathy Ruhl concluded what teachers probably want to hear: "Teachers should let the nature of the task dictate seating arrangements" (see bit.ly/SeatClass).

But it added: "Evidence supports the idea that students display higher levels of appropriate behaviour during individual tasks when they are seated in rows, with disruptive students benefiting the most".

Whether that is down to certain teachers and schools adopting rows, or the rows themselves, is a difficult one to unpick.

A room with a view

Meanwhile, views from classrooms have also been shown to matter – at least in some circumstances. A US study showed that college students on a writing composition course gave that course a more positive rating and got higher end-of-semester grades if they had a view of nature from the classroom window (bit.ly/ClassNature). Attendance levels, however, were the same whether there was a view of nature or not.

Similarly, a study by Ming Kuo, associate professor in the Department of Natural Resources and Environmental Sciences at the University of Illinois, found that "even small exposures to nature are beneficial. If you're indoors, having a view of your yard as opposed to facing the wall, that makes a difference [to learning]" (bit.ly/ViewClass).

Whether putting a few plants around the classroom can have a similar effect is unclear, and the balance between such benefits and the potential distraction of a view of nature would need to be carefully considered. But the research might be useful to anyone looking to back up their plea to have the school garden sorted out.

So the evidence suggests that light, airy classrooms with a nice view of nature (and a seating design of your choice) are what you should be aiming for.

The Holistic Evidence and Design (Head) study, led by Peter Barrett of the University of Salford, offers further evidence that these things all matter. But it also stresses the importance of a number of other factors, too.

The 2015 study, conducted in English primary schools using data from 3,766 pupils, concluded that differences in physical classroom design accounted for 16 per cent of the variation in the learning progress of the children in those spaces over a year. The study concluded that factors such as light, temperature and air quality accounted for about half of the impact on learning, backing up previous studies.

What accounted for the other half? The study found that about a quarter of the

difference in performance was down to what researchers called individualisation factors. These included the extent to which the space was flexible, with break-out spaces and zones for different activities, for example. They also included the elements that give pupils a sense of ownership of their classroom, such as display of children's work on the walls and labelling of coat pegs and trays.

But the research showed that the impact of different factors varied depending on the subject being studied.

"In relation to maths, individualisation becomes very important, disproportionately different to the rest," says Barrett. "With maths, there's a whole literature on confidence issues, so you can imagine if somebody felt more comfortable in their classroom it would feel less alienating and more like their space, then maybe that would help."

The final quarter of the overall effect of the classroom on learning was down to what the study called stimulation – the complexity of the visual environment and the colours. Researchers concluded that wall displays should cover 50-80 per cent of the wall area and that the wall colours should be muted, with elements of stronger colours.

The study of 153 classrooms in three diverse English authorities used sophisticated modelling to come to its conclusions, and the results are highly regarded. However, it still had its limits: researchers could not look at whether classrooms improved behaviour because the only data available was on exclusions and numbers were too small. The study also measured progress in only one year and did not take into account differences in individual teacher performance.

Its definition of learning progress was also limited, as it looked only at English and maths progress. The research was restricted to primaries and a bid to carry out a further study of secondaries was turned down. "The spaces between the classrooms, the social dynamic of these spaces in secondaries would be massively important," Barrett suspects.

On the displays point, it should also be noted that research by Anna Fisher et al (2014) called "Visual environment, attention allocation and learning in young children: when too much of a good thing may be bad" found that "children were more distracted by the visual environment, spent more time off task and demonstrated smaller learning gains when the walls were highly decorated than when the decorations were removed".

Despite the limitations, the Head study has been transformed into "Clever Classrooms" guidance to show staff what cheap and easy changes they can make to improve learning (bit.ly/ClassClever).

"I don't think it's a matter of expense," says Barrett. "We are talking about schools that are just sensibly designed, and sometimes it's just a matter of changing the colour or of opening the windows. These aren't necessarily expensive things."

So far, so traditional in terms of what has been studied. But what about the usefulness of more innovative classroom spaces, designed specifically for self-guided learning, collaboration and problem-solving? Ones that are, dare we say it, designed to prepare children for the oft-cited "jobs that have not been invented yet"?

Classrooms scattered with beanbags, upholstered hidey-holes for self-guided study and cave-like gathering spaces might make some staff recoil in alarm. But others following a more student-centred pedagogy have found they have benefits such as motivating children by offering them choice and control over where and how they work.

Intuitively at least, homely elements such as comfy sofas and round tables also appear to support wellbeing, friendships and teamwork.

Lene Jensby Lange, chief executive of Autens, a Danish consultancy that advises schools designing their learning spaces, says: "Choice is really, really important. Kids can't quit their 'jobs' [as adults can], so as a student you can at least choose how and where you sit. It's a powerful signal to a child to be given choice."

Solving the academic riddle

But even supporters of innovative designs would admit that the rigorous, empirical academic evidence for their benefits is still thin. Academic John Hattie's famous *Visible Learning* meta-analysis of research into influences on educational achievement found that "open" classrooms, as opposed to traditional ones, had a negligible effect (bit.ly/HattieLearn).

However, this, says Wes Imms of the University of Melbourne, was based on research studies available at the time and "speaks more to the lack of evidence than it does to the reality".

Hattie is now working with Imms on the Innovative Learning Environments and Teacher Change project, which is looking at the effectiveness of non-traditional learning spaces (bit.ly/HattieImms).

"Governments around the world are putting huge amounts of investment into what is loosely called innovative learning environments, and there's very little evidence to say they do what these governments are saying they want to see happen," says Imms. "But I'm convinced we can solve the academic riddle of getting quality data."

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He predicts that innovative, flexible learning environments do help children become "more collaborative, more communicative, with better critical thinking" and he says preliminary results of the study suggest this. However, boxy classrooms and explicit teaching techniques will remain effective for getting exam grades, he believes.

"I think the didactic sort of approach will give better results according to Pisa [the Programme for International Student Assessment] and the rest, but the question has to be what parents in reality want for their kids, what do employers want?"

Academic studies are all very well, of course, but transferring all this to practice can be difficult and risks negative effects.

Some have taken up the challenge. In Stockport, executive head Lisa Woolley oversees two primaries in the Laurus Trust: Gorsey Bank Primary and Cheadle Hulme Primary. The classrooms at the newly built Cheadle Hulme have been designed by IBI architects on the "Clever Classrooms" principles that emerged from the Head study. The school opened in September 2018 with 60 children in Reception and a cohort of nursery children.

Classrooms feature oversized windows and views out on to green spaces. There are spacious, light corridors. Furniture is in natural finishes and spaces are flexible. But are children learning better?

Woolley says that, although she thinks that the pupils' "phenomenal" progress is largely down to good teaching, the "sense of ownership" children have does contribute.

"When you look at the quality of the work the children are producing, I do think it's to do with the environment they are in as well as the teaching they are having," she says. "It's an environment that really enhances our teaching and learning; you don't feel like you're battling with it."

At Katrinedals School, a primary and lower secondary school in Copenhagen, Denmark, staff have used furniture as part of a drive to encourage better friendships and collaboration between pupils. Round tables encourage group work, says deputy head Kim Rasmussen, and pupils are encouraged to work together on comfy sofas and banquettes.

But he admits that, although grades went up after the design changes, it was hard to assess the impact because so many reforms were carried out at the same time. "But we know it didn't hurt them," he says.

Watch this space

And what did Gary Spracklen, with his supermarket muse, do with all this research? Busy classroom clutter was cleared out, posters were taken off windows to bring in more natural light and the colour scheme went from busy brights to muted greys and whites. Areas of tiered seating and writable surfaces promote collaboration between the students – a key principle of the redesign. They also created many "spaces within spaces" to support group work: lessons take place in a tepee, a summer house and even Spracklen's office.

"We had to be creative," says Spracklen, explaining that parents were co-opted for much of the work and many new items were bought in Ikea.

And the results of the refit are promising: Sats scores are up and the staff and children love their new spaces. Spracklen even wrote a chapter in the forthcoming book *Planning Learning Spaces* about classroom design.

But he is nonetheless sceptical about the overall potential of physical improvements to boost a school's fortunes.

"It's really hard to say in our case [if the changes have made a difference] because we are making so many changes at once – we had three years of declining data before I arrived in September 2017, and last year we saw a big jump in our Sats results," he says.

"Changing the environment is not going to be the key thing. You can see countless new schools that have opened that have gone into special measures. It's like saying a new car's going to improve your driving…but actually it's more that the new car has probably got lots of features that will help you improve your driving."

Indeed, taking a leaf of out Tesco's book, maximising your space might be a case of "every little helps".

Irena Barker is a freelance journalist.

Planning Learning Spaces*, from Laurence King Publishing, will be published in October*