

Is Office Air Quality Making You Less Productive?

AP Photo/Jim Mone

If there was a cost-effective way to alter the environment and design of a classroom that helped students achieve 60 percent better test scores, it follows that educators would be tripping over themselves on the way to Home Depot. Would we make a similar effort if we knew altering our offices could improve cognitive functioning during the workday? Not yet, according to Harvard researchers, whose studies on the impact of ventilation, lowering carbon dioxide concentration, removing toxic chemicals and improving indoor air quality suggest building managers, architects, and designers need to begin taking environmental quality as seriously as they take notions of collaborative space and productivity.

"There's a little disconnect between the public health silo and those making decisions about buildings," says Piers MacNaughton, a doctoral student who, while working with lead researcher [Joseph Allen](#), Director of Harvard's Healthy Buildings Program, has conducted extensive research documenting the connections between poor indoor environments and cognition. "I don't think our field has done a good job of reaching out to the real estate developers, managers, and owners of businesses that can make this change. I don't think it's acknowledged that changing these factors can make a difference."

Of the group's numerous research projects and reports, "[Economic, Environmental and Health Implications of Enhanced Ventilation in Office Buildings](#)," published last November, lays out the case the most direct terms. By studying the performance of office workers from seven different cities under various ventilation scenarios, the researchers and their co-authors concluded that the health benefits associated with enhanced ventilation rates "far exceed the per-person energy costs relative to salary costs." Here's the breakdown (emphasis added):

"Doubling the ventilation rate from the American Society of Heating, Refrigeration and Air-Conditioning Engineers minimum **cost less than \$40 per person per year** in all climate zones investigated. Using an energy recovery ventilation system significantly reduced energy costs, and in some scenarios led to a net savings. At the highest ventilation rate, adding an ERV essentially neutralized the environmental impact of enhanced ventilation (0.03 additional cars on the road per building across all cities). **The same change in ventilation improved the performance of workers by 8%, equivalent to a \$6,500 increase in employee productivity each year.** Reduced absenteeism and improved health are also seen with enhanced ventilation."

Allen, a longtime public health researcher, spoke at Growing Cities, a forum put on by Atlantic Magazine last month, about how addressing this issue can have a massive impact in office and institutional settings.

Changes such as better air ventilation and filtration (which removes outdoor air pollution), reducing indoor chemical exposure, and instituting a good dust and allergen cleaning program can add up.

"We have been ignoring the 90%," Allen stated in [a release about the study](#). "We spend 90% of our time indoors and 90% of the cost of a building are the occupants, yet indoor environmental quality and its impact on health and productivity are often an afterthought."

During one of their experiments, researchers gave participants a cognitive test in two scenarios. When they tested a standard office environment versus what they called "green days," or an environment with reduced chemicals (specifically volatile organic compounds, often found indoors), they found subjects scored 60%

higher on tests. The results were even more dramatic when they tested for "green-plus" days, with both improved ventilation and a reduction in VOCs. Subjects [scored 100 percent higher](#).

"This data hasn't been here and been so objective until now," says MacNaughton. "We really haven't had the equipment and testing methods to quantify it like this until now."

Results from Harvard study; the green points show the improved performance registered in a healthier indoor environment.

While there have been previous studies and reports on the subject, there are many reasons this data hasn't been recognized or acted upon in the past, says MacNaughton. Repairing a ventilation system can be daunting. Current standards for ventilation are set at acceptable minimums, instead of optimizing for health. The United States has an "innocent until proven guilty" system for testing chemicals, requiring study before something is banned, whereas Europeans require basic testing before certifying new chemicals. "We've already found the easy problems to solve, such as asbestos," says MacNaughton. "Now we're getting into chemicals that have a less dramatic effect." There's also a split incentive system in the way many offices are run holding back change. The benefit of a cleaner, healthier office falls to the tenant, while the building manager, who pays for improved infrastructure and ventilation out of his or her own pocket, doesn't get to see the bulk of the benefits. "We tell managers and building owners that they can gain a competitive advantage if they provide a better, healthier environment," says MacNaughton. He also sees the situation getting better. Discussions of health have come to the forefront, and lots of architects and designers are starting to discuss the issue. Harvard has pledged to remove all flame retardants from materials they buy, setting a "great example of leading from the top," he says. Standards are being adapted and formed, he says, and eventually, awareness, potentially through more self-monitoring or smart office systems, as well as demand for better workspaces, will spur change. MacNaughton is doing his part; the next phase of their research, which they're publishing this fall, will include months of testing in real-world situations.