

The Potential Advantages Of Increasing Ventilation In Schools

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Background

While there are broad benefits to society from all buildings becoming more naturally comfortable and therefore more energy efficient, the benefits of increasing ventilation in schools may potentially deliver the largest benefit to society.

Increased Ventilation = Decreased Energy Costs

There are few arguments against the science showing that increasing natural ventilation decreases the amount of energy consumed for heating and cooling buildings.

- **A study of 39 offices at Sydney University in 2002 identified annual energy savings on heating and cooling of 79%**
David Rowe and Cong Truc Dinh (2001) An Experiment with Hybrid Ventilation: A More Sustainable Approach To Thermal Comfort. Architectural Science Review, Vol 44, Iss. 2, 2001.
- **A 2001 study of 18 UK buildings identifying an average of 52% measured annual savings in heating and cooling energy.**
Bunn R. and Cohen, R. (2001) Learning from PROBE, Building Services Journal, May 2001.
- **In 2001 the CSIRO calculated that in a 12 hour a day building, mechanical cooling is not necessary 48% of the time**
Quoted in "Emerging technologies in ventilation" by Dr Mark B Luther and Dr Zhengdong Chen in TEC12, Nov 2002

Decreasing energy consumption decreases electricity bills which in turn decreases school expenditure potentially freeing up funds for other productive uses.

Increased Ventilation = Improved Learning Outcomes = Increased Future Productivity

The productivity of future generations of workers will be impacted greatly by today's educational outcomes. There is a strong body of science showing a strong relationship between ventilation and learning outcomes.

- **Children in classrooms with higher outdoor air ventilation rates tend to achieve higher scores on standardized tests in math and reading than children in poorly ventilated classrooms.**
Shaughnessy, R., U. Shaughnessy, et al. 2006. "A preliminary study on the association between ventilation rates in classrooms and student performance." *Indoor Air* 16(6):465-468.
- **One international review of 30 green schools, Greening America's Schools: Costs and Benefits, found that green schools and universities deliver:**
 - 41.5% improvements in health of students and teachers (such as reduced incidence of asthma, 'flu, respiratory problems and headaches),
 - Up to 15% improvement in student learning and productivity,
 - Up to 25% improvement on test scores from good lighting and ventilation.

<http://www.gbca.org.au/resources/greening-your-school/why-green-our-schools/a-healthy-and-productive-place-to-learn/2152.htm>

- **Controlled studies show that children perform school work with greater speed as ventilation rates increase. The performance of adults, including teachers and school staff, has also been shown to improve with higher ventilation rates.**
Wargocki, P., D.P. Wyon, et al. 1999. "Perceived air quality, SBS-symptoms and productivity in an office at two pollution loads." *Proceedings, Indoor Air '99: The 8th International Conference on Indoor Air Quality and Climate*. Edinburg, Scotland.2:131-136.
Wargocki, P., D.P. Wyon, et al. 2000. "The effects of outdoor air supply rate in an office on perceived air quality, sick building syndrome (SBS) symptoms and productivity." *Indoor Air* 10(4):222-236.
- **A European Multidisciplinary Scientific Consensus Meeting reviewed the scientific literature on the effects of ventilation on health, comfort and productivity in offices, schools, homes and other nonindustrial environments. The group agreed that ventilation is strongly associated with comfort and health and found an association between ventilation and productivity (performance of office work).**
Wagocki P, Sundell J, Bischof J, Brundrett G, Fanger PO, Gyntelberg F, Hanssen O, Harrison P, Pickering A, Seppanen OA and Wouters P. 2002. Ventilation and health in non-industrial indoor environments: Report from European Multidisciplinary Scientific Consensus Meeting (EUROVEN). *Indoor Air* 12:113-128.
- **A 2005 study of 10-year-old school children showed that increasing ventilation rates could improve the children's performance in tasks representing eight different aspects of schoolwork, from reading to mathematics.**
Wargocki P, Wyon DP, Matysiak B and Irgens S 2005. The effects of classroom air temperature and outdoor air supply rate on the performance of school work by children. *Proceedings of Indoor Air 2005*. Beijing, China: Tsinghua University Press.
- **A literature review by Mendell and Heath found evidence suggesting a link between low outdoor ventilation rates in buildings and decreased performance in children and adults.**
Mendell MJ and Heath GA 2004. Do indoor pollutants and thermal conditions in schools influence student performances? A critical review of the literature. *Indoor Air* 15:27-52.
- **A study in eight English primary schools of over 200 pupils showed significantly faster and more accurate standardised test responses (by up to 15%) when classrooms had high ventilation rates compared with low ventilation conditions.**
Bako-Biro Zs, Clements-Croome DJ, Kochhar N, Awbi HB and Williams MJ 2011. Ventilation rates in schools and pupils' performance. *Building and Environment* 48 (2011) 1-9.

Jonathan Dalton (Technical Director of Viridis E³) asserted in his seminar "The IQ of IEQ" at the Green Cities 2012 Conference (<http://www.thefifthestate.com.au/archives/32909>) that the current requirements for ventilation openings in schools in the Australian Standards are not currently sufficient to generate enough ventilation to maintain carbon dioxide, volatile organic compounds and hydrocarbons at safe levels for children and argued that the Australian Standards should be updated.

Increasing ventilation requirements in schools would be a sound investment in the future of our society.