
EPA

# Student Health and Academic Performance

Quick Reference Guide

## All Children Deserve a Healthy Learning Environment

Children are inherently more vulnerable to environmental hazards because their bodies are still developing. Substandard environmental conditions in schools, such as insufficient cleaning or inadequate ventilation, can cause serious health problems for children. Evidence that indoor air quality (IAQ) directly impacts health and student academic performance continues to mount.[1,2]

IAQ refers to those characteristics of the air in indoor environments, such as levels of pollutants, humidity, temperature, etc., that impact the occupants' health, comfort and ability to perform.

***Taking steps to improve the IAQ of schools is critical to bettering student health and academic performance.***

## Building the Case with Evidence

Scientific evidence has long demonstrated an association between poor IAQ and respiratory health effects, including asthma. Maintenance issues in schools, such as mold and moisture or excessive use of cleaning chemicals, have been shown to trigger asthma and allergies.

According to the Centers for Disease Control and Prevention (CDC), asthma is one of the leading causes of school absenteeism.3 Multiple studies have found that children's overall performance decreases with illnesses or absences from school.4,5

### *The Scientific Evidence is Mounting*

Qualitative and quantitative evidence demonstrating the relationship between IAQ and human performance and productivity has become more robust. Studies demonstrate that improved IAQ increases productivity and improves the performance of mental tasks, such as concentration and recall in both adults and children.[6] This strengthens the case for schools to develop IAQ management plans, which include critical maintenance tasks, as a key part of an education development strategy.

> *"Each year since our IAQ management program began, we have been able to boost both reading and math test scores and have created exceptional learning environments that promote student success."* – Dave Hill, Blue Valley School District, Kansas

## Evidence from Scientific Literature

Scientific evidence shows that there are key areas in which schools can take action to improve IAQ in order to advance the health and performance of students and school staff. In fact, a structured maintenance program is a cornerstone of academic performance and IAQ.

### *Managing Your School Environment Despite Tight Operating Budgets*

School boards and administrators often consider the maintenance budget as *soft money* that they can cut without affecting core academic program needs; however, scientific literature demonstrates otherwise:

- Health, attendance and academic performance can improve with increased maintenance.[7, 8]
- Schools with better physical conditions show improved academic performance, while schools with fewer janitorial staff and higher maintenance backlogs show poorer academic performance.[9]

### *The Effects of Air Ventilation on Health and Performance*

Most schools' ventilation rates are below recommended levels.[10] However, ensuring adequate air ventilation rates in all classrooms can:

- Reduce absences and the transmission of infectious diseases.[11]
- Improve the overall health and productivity of teachers.
- Improve test scores and student performance in completing mental tasks. [12, 13, 14, 15, 16, 17]

In one study, students in classrooms with higher outdoor air ventilation rates scored 14 to 15 percent higher on standardized test scores than children in classrooms with lower outdoor air ventilation rates.[18]

In addition, ensuring that heating, ventilation and air conditioning (HVAC) drainpans and other components are clean reduces the chance of occupant illnesses.

### *Control Mold and Moisture to Reduce Asthma Symptoms*

Dampness and mold in homes, offices and schools cause a significant increase in several respiratory and asthma-related health outcomes.[19, 20]

- Asthma is the leading cause of absenteeism in schools, which hinders classrom achievement. [21]
- Symptoms identified in building occupants exposed to dampness or mold include: coughing, throat irritation, tiredness, headache and increased wheezing.

*"Our district implemented an IAQ management plan that led to unprecedented academic success for our students. Since 2005, we have seen an increase of 17.3 percent on test scores and an increase in the average daily attendance rate to 97 percent, allowing students to have more classroom time."*
– Frank DiNella, Keller Independent School District, Texas

## Establish an IAQ Management Program

Many effective school IAQ management programs are implemented in conjunction with other health programs, such as physical education, nutrition and counseling services. Implementing IAQ management strategies, including moisture management, integrated pest management and adequate ventilation, help control environmental triggers and are linked with asthma and other health initiatives.

Literature suggests that integrating health programs into a coordinated or comprehensive program can achieve improved results for learning and health, while allowing schools to be more resource efficient.[1,2]

**For more information on school IAQ management programs, visit http://www.epa.gov/iaq/schools/.**

## References


[1] Stolz, A.D., A. Knickelbein, and S. Coburn. 2008. "Linking coordinated school health to student success." Presentation at the Annual Conference of the National Association of School Nurses, Albuquerque, NM.

[2] Vinciullo, F. 2008. "The relationship between multi-component school health programs and school achievement." Presentation at the Annual Conference of the National Association of School Nurses, Albuquerque, NM.

[3] Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion. Healthy Youth! Retrieved July 14, 2009, from CDC's Asthma Health Topics Web site: http://www.cdc.gov/HealthyYouth/Asthma/ Also see Akinbami, L.J. 2006. The State of Childhood Asthma. United States, 1980-2005. Advance Data from Vital and Health Statistics: no 381, Revised December 29, 2006. Hyattsville, MD: National Center for Health Statistics.

[4] Silverstein, M.D., J.E. Mair, et al. 2001. "School attendance and school performance: A population-based study of children with asthma." Journal of Pediatrics 139(2):278-283.

[5] Moonie, S., D.A. Sterling, et al. 2008. "The relationship between school absence, academic performance, and asthma status." Journal of School Health 78:140-148.

[6] For a summary of the impact of indoor environmental quality on work and school performance, as well as other IAQ research findings, see the IAQ Scientific Findings Resource Bank (SFRB) established as a cooperative venture between EPA and the Lawrence Berkeley National Laboratory: Accessible at http://www.iaqscience.lbl.gov/performance-summary.html

[7] Schneider, M. 2002. "Public school facilities and teaching: Washington, DC and Chicago." 21st Century School Fund, Washington, D.C.

[8] Earthman, G.I., C.S. Cash, and D. Van Berkum. 1995. "Student achievement and behavior and school building condition." Journal of School Business Management, 8(3).

[9] Branham, D. 2004. "The wise man builds his house upon the rock: The effects of inadequate school building infrastructure on student attendance." Social Science Quarterly (85)5.

[10] California Energy Commission. 1995. Air exchange rates in non-residential buildings in California. California Energy Commission.

[11] Nazaroff, W. 2011. "Norovirus, gastroenteritis, and indoor environmental quality. Editorial." *Indoor Air* 21: 352-356.

[12] Myhrvold, A.N., E. Olsen, and O. Lauridsen 1996. "Indoor environment in schools—Pupils health and performance in regard to CO2 concentrations." Proceedings, Indoor Air '96: The 7th International Conference on Indoor Air Quality and Climate. Nagoya, Japan. 4:369-371.

[13] Mendell, M. 1993. "Non-specific symptoms in office workers: A review and summary of the epidemiologic literature." Indoor Air 3(4):227-236.

[14] Seppänen, O., W.J. Fisk, et al. 1999. "Association of ventilation rates and $CO_2$ concentrations with health and other responses in commercial and institutional buildings." Indoor Air 9(4):226-252.

[15] Apte, M., W. Fisk, and J. Daisey. 2000. "Associations between indoor $CO_2$ concentrations and sick building syndrome symptoms in U.S. Office buildings: An analysis of the 1994-1996 BASE study data." Indoor Air 10(4):246-257.

[16] Shendell, D. G., R. Prill, et al. 2004. "Associations between classroom $CO_2$ concentrations and student attendance in Washington and Idaho." Indoor Air 14(5): 331-41.

[17] Sundell, J., H. Levin, et al. 2011. "Ventilation rates and health: multidisciplinary review of the scientific literature." Indoor Air 21: 191-204. http://onlinelibrary.wiley.com/doi/10.1111/j.1600-0668.2010.00703.x/pdf

[18] Shaughnessy, R.J., et al. 2006. A preliminary study on the association between ventilation rates in classrooms and student performance. Indoor Air 16(6): 465-468.

[19] Fisk, W.J., Q. Lei-Gomez, and M.J. Mendell. 2007. "Meta-analyses of the associations of respiratory health effects with dampness and mold in homes." Indoor Air 17(4):284-295.

[20] Mudarri, D. and W. J. Fisk, 2007. "Public health and economic impact of dampness and mold." Indoor Air 17(3):226-235.

[21] Haverin-Shaughnessy U., M. Turunen, et al. 2012. "Sixth grade pupils' health and performance and indoor environmental quality in Finnish school buildings." *British Journal of Education Research* 2(1) 42-58.