New Tools: How Green Is Your School?

New technology helps district leaders ensure healthy learning environments for staff and students.

By Jerry Lamping

More and more, schools across the country are being urged to become green. What does it take to become a high-performance green school? What features and metrics are vital to attaining green school status and reaping its benefits?

One important green school metric is the indoor environmental quality (IEQ) of the school's classrooms. Recent research has shown direct correlations between a school's IEQ and academic performance, attendance, and health. In its research report "The Impact of School Buildings on Student Health and Performance," the U.S. Green Building Council's Center for Green Schools explored how the environment affects a child's experience in the classroom and how different stakeholders play important roles in creating a healthy and green indoor environment.

Green School Events and Resources

ASBO International's Green Schools Advisory Group
- Several webinars on a variety of green school subjects
  www.asbointl.org/IndoorAirQualityResources.htm

Center for Green Schools of U.S. Green Building Council
- "The Impact of School Buildings on Student Health and Performance: A Call for Research" white paper, video, and podcast, mcgraw-hillresearchfoundation.org/2012/02/27/the-impact-of-school-buildings-on-student-health-and-performance/
- Green Classroom Professional Certificate Program
  www.centerforgreenschools.org/main-nav/k-12/curriculum/Greenclassroom.aspx

Collaborative for High Performance Schools
- The Operations Report Card
  www.chps.net/dev/Drupal/orc

Council of Educational Facilities Planners International
- 2013 School of the Future Design Competition
  www.cefpi.org/i4a/pages/index.cfm?pageid=3338

Green Schools National Network
- Third Annual Green Schools National Conference
  www.greenschoolsnationalconference.org/

Healthy Schools Campaign (HSC)
- 2012 Green Cleaning Webinar Series
  www.healthyschoolscampaign.org/programs gcs/2012webinars/index.php
- School Environmental Health Program
  www.healthyschoolscampaign.org/programs/envhealth/

Healthy Schools Network Inc.
- 10th National Healthy Schools Day, April 23
  www.nationalhealthyschoolsday.org/
- Coalition for Healthier Schools
  www.healthyschools.org/coalition.html

U.S. Department of Education
www2.ed.gov/programs/green-ribbon-schools/index.html
- Green Ribbon Schools
- Green Strides Webinar Series about 16 green school features

Recently, Elizabeth Heider, chair of the U.S. Green Building Council's board of directors, said that in the next few years, the emphasis of LEED (Leadership in Energy and Environmental Design) will likely shift from improving energy and water use toward a focus on improving human health and productivity through better air quality and features such as natural lighting.

Air quality is affected by the invisible airborne particles, irritant gases, and infectious microbe levels that are present in a classroom. These contaminants cause inflammation in the trachea, lungs, heart, blood vessels, and even the brain. These reactions can result in acute and chronic illnesses that impair the development of a child's organs and reduce performance capability.

Although there are no recognized guidelines or standards with which to determine an acceptable level of these contaminants, portable and affordable measuring instruments are available that can be used to acquire empirical data in a classroom and facilitate comparisons between classrooms with and without IEQ concerns. Many schools are using these handheld devices to ascertain whether the school's IEQ is supporting a green school rating and providing a healthy environment for the physical development of its students.

Measuring Invisible Particles

Handheld optical particle counters that were developed for applications in the manufacture of electronic equipment are now being used to measure levels of invisible airborne particles that may be causing respiratory problems for students and teachers in crowded classrooms.

Dave Blake of the Northwest Clean Air Agency and Rich Prill of the Washington State University Extension Energy Program put together an IEQ monitoring station for use in schools and have monitored airborne particle levels in classrooms as part of their program to help schools improve their IEQ conditions.

The airborne particles are counted with a handheld six-channel laser instrument similar to the HHPC-6 handheld particle counter. They have presented their ideas for conducting IEQ school surveys with optical particle counters at several EPA *IAQ Tools for School* national symposiums and webinars.

Measuring Irritant Gases

Instruments that were developed for life safety programs in industrial plants are now being used to measure levels of irritant gases that may be triggering asthma and allergy symptoms in teachers and students in underventilated classrooms.

Although the measurement of carbon dioxide levels in classrooms is commonly used to determine the outside air ventilation rate, this metric does not establish the actual level of gas-phased contamination. More accurate measurements can be gathered using a total volatile organic compound (TVOC) meter.

TVOCs include a large number of compounds commonly found

indoors. These compounds have many sources, such as evaporation of isopropyl alcohol, gasoline, paint solvents, spray product propellants, combustion byproducts, emissions from household furnishings, and some natural sources, such as food items and types of mold.

As with other gas-phased contamination, the extent and nature of the health effects from TVOC chemicals depends on many factors, including level of exposure and length of time exposed. Any individual with chemical sensitivities could be affected by elevated TVOC readings within a school building. Eye and respiratory tract irritation, headaches, dizziness, visual disorders, and memory impairment are among the immediate symptoms of exposure to some TVOCs.

Portable IEQ monitoring devices now come with a 10.6-electron volt photoionization sensor for part-per-billion or part-per-million concentration range measurement of TVOCs.

Measuring Infectious Microbes

Adenosine triphosphate (ATP) meters that were developed for hygiene assurance practices in food-processing plants are being used to measure levels of microbial colonies that may be living on high-touch classroom surfaces and spreading onto the hands of teachers and students.

Recently, the International Sanitary Supply Association and the Cleaning Industry Research Institute announced that they began the process to develop a clean standard for K–12 schools that will ultimately promote clean, green, and healthy indoor school environments.

After three years of extensive field research, both organizations say that the scientific research team has the technical details necessary to support such a standard. The research project took thousands of ATP measurements of bacteria in RODAC (replicate organism detection and counting) plates, settled dust, indoor air measures, and building conditions to learn whether practical existing measurement tools and processes were available to consistently determine the level of cleanliness in real-world conditions.

The project's findings show that ATP meters and techniques can provide a reliable measure of cleanliness, and that reductions in ATP levels correlate with reductions in bacterial count based on RODAC plate measurement. Moreover, the research has demonstrated that consistent cleaning results can be obtained on a variety of surfaces common in K–12 schools.

In addition, classroom dust samples can now be analyzed using mold-specific quantitative polymerase chain reaction for quantifying mold species. By using a simple algorithm to calculate a ratio of water damage-related species to common indoor molds, a relative score called the Environmental Relative Moldiness Index can be established. Using the index number, a facilities manager can determine whether prior water damage is supporting microbial life that is affecting the health of teachers and students.

Also, new research funded by the Sloan Foundation and reported at this summer's Healthy Building 2012 Conference, is looking at the entire microbial life (microbiome) of buildings to determine how microbes affect the indoor environment.

Tools for School Health

Indoor environmental quality may not be the only aspect of a green school, but it is one of the most significant. Advanced environmental instrumentation technology now provides school business officials with tools to measure the factors that contribute to their schools' IEQ. These new devices make it possible to identify the toxic or pathogenic contaminants within a school building and to take immediate corrective action when harmful levels of such contaminants are detected.

A clean, green, and healthy school is more achievable with the help of these modern handheld tools and an established program for periodic IEQ measurements.

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