



# *Innovation for Education*

*Raising performance in K-12 schools*



# Helping students excel



*Developing young minds deserve the best possible learning environment. Students perform better in schools that are comfortable, quiet, properly ventilated and well lit. Children demonstrate this fact in classrooms every day. And it is proven by research time and time again.*

The U.S. Environmental Protection Agency cites a number of critical outcomes that are achieved when schools adopt best practices in school design and maintenance, including the following:

- Higher test scores
- Increased average daily attendance
- Lower operational costs
- Improved teacher satisfaction and retention<sup>1</sup>

Trane® helps school systems around the U.S. create the indoor environment that is essential to learning. Through our technology and expertise, you can unlock your school building's full potential, resulting in greater comfort for students and staff, higher energy efficiency and lower operating costs.

## Engaging students

*Using energy wisely is everyone’s responsibility — even kids can make a difference!*  
*Trane energy education programs engage students and teachers in your district’s sustainability objectives.*

### The BTU Crew™

Students learn about energy: what energy really is and things they can do to conserve energy at school and at home. The BTU Crew introduces students to careers in science, technology, engineering and math (STEM) that can make a positive contribution to the environment. The curriculum can be customized to meet local needs and adapted for older or younger students.

### Energy dashboard

A fun, visually impactful and easy-to-use online tool brings the concepts of energy efficiency and sustainability into the classroom. Students learn about the dynamics of energy by getting involved in the design of dashboard metrics, then tracking results toward energy and carbon footprint goals.



*The Trane energy performance dashboard helps students gain an understanding of how their own everyday actions impact school energy consumption and the environment.*

1. The U.S. Environmental Protection Agency, “Benefits of a High Performance School,” <http://www.epa.gov/iaq/schooldesign/highperformance.html> (accessed December 5, 2011).



## Improving student performance

*There's no smarter, more far-reaching investment than one made for our children. The ability to manage temperature, humidity, air quality and sound levels pays off for schools and their communities today and well into the future.*

The ramifications for schools lacking good indoor air quality are well documented:

- Poor indoor air quality (IAQ) has been linked to reduced teacher and student performance, short- and long-term health problems and low staff retention.<sup>2</sup>
- Students and teachers struggle when they're distracted by poor acoustics, glare, mildew, lack of fresh air and temperatures that are too hot or cold.<sup>3</sup>

Fortunately, the opposite is also true. When students are able to work in a comfortable environment with an ample supply of outdoor air, their speed and accuracy on numerous learning tasks is significantly improved.<sup>4</sup> For this reason, consider the positive impact on air quality that can be achieved through Trane technology and service solutions.

2. "Market Sector Snapshot: K-12 Schools," ESOURCE Report, March 2008.

3. Lawrence Berkeley National Laboratory, "Do Indoor Environments in Schools Influence Student Performance?" 2006

4. Source for HVAC experiments: 1) EFA. 2001. "Indoor air pollution in schools." Helsinki: European Federation of Asthma and Allergy Associations. 2) Wargocki, P., and D.P. Wyon. 2006. "The effects of outdoor air supply rate and supply air filter condition in classrooms on the performance of schoolwork."

### Assure proper ventilation

Schools pose greater potential for poor air quality than most other indoor environments. They contain numerous pollution sources — lab chemicals, cleaning supplies, chalk dust and mold — and they average four times greater occupant density than a typical office building.<sup>5</sup>

### Maintain ideal temperature and humidity levels

Studies confirm that the ideal temperature range for effective learning in reading and mathematics is between 68 and 74 degrees Fahrenheit. Trane® advanced controls provide facility managers with scalable building automation solutions for centralized control of one building or the entire school district — ensuring that optimal control of temperature and humidity levels for every classroom is at your fingertips.

### Improve acoustics

Sound management is particularly important in schools. The ability to hear teaching instruction is, of course, vital to learning. Yet as many as a third of all students miss up to 33 percent of the oral communication in the classroom.<sup>7</sup> In addition, poor acoustics exacerbate pre-existing obstacles such as learning disabilities, impaired hearing or struggling to learn in a non-native language.<sup>8</sup> The maximum permissible background sound level for “typical” classrooms is 35 dBA according to both the American National Standards Institute (ANSI) and the Acoustical Society of America (ASA). Yet there is considerable evidence that background noise varies widely from classroom to classroom and from school to school — regardless of building age or location.

Trane helps schools achieve the right acoustical levels because acoustical performance is a key consideration in everything we build. Trane not only offers the quietest equipment, Trane Acoustical Program (TAP™) also simplifies the acoustics design process for engineers by comparing the sound levels of various HVAC system and construction options.

5. Student Health and Academic Performance: Quick Reference Guide, EPA, November 2012.  
6. Earthman, G., “School Facility Conditions and Student Academic Achievement.” UCLA Institute for Democracy Education & Access, 2002.  
7. “Effects of classroom acoustics on performance and well-being in elementary school children: A field study,” M. Klatte, J. Hellbruck; June 2010.  
8. Nelson and S. Soli, “Acoustical Barriers to Learning: Children at Risk in Every Classroom,” Language, Speech and Hearing Services in Schools, 2000.



### Clean air technology

The Trane Catalytic Air Cleaning System™ improves indoor air quality through an innovative blend of three technologies: filtration, germ-killing ultraviolet light and a photo catalytic oxidation process. Dust, particles, odors, VOCs, viruses and bacteria are virtually eliminated.

**A Trane Stealth™ air cooled chiller** delivers the highest efficiencies and the lowest published sound levels in the industry, making it the perfect choice to help schools across the country impact learning through noise reduction. This creates a quieter facility for those in the neighborhood, while making a positive impact on the bottom line.

## Helping the bottom line

*Trane® is dedicated to making schools better places to learn and creating buildings that are healthy, comfortable and efficient.*

*As your complete energy solutions partner, our main focus is to help you reach your goals. The Trane Building Advantage™ portfolio of solutions combines technology and energy services that together offer schools the expertise you can count on to help alleviate budgetary concerns.*

### Energy services partner

Through Trane Building Advantage, our building professionals utilize advanced building management systems and service expertise to enhance energy management and create a more comfortable school building. We provide an ongoing partnership that identifies goals based on your needs and budget, and offers scalable solutions that deliver the level of service and support you require, targeted recommendations, implementation expertise, and validation of results to give you proof that your system is impacting the bottom line.

### Simplified procurement

Our contract with cooperative purchasing alliance U.S. Communities™ enables us to offer our HVAC systems, advanced controls, building contracting and energy services while satisfying competitive bid requirements for most state and local government agencies. This provides your school with the opportunity to get the best system for your needs long term, not simply the lowest-cost option today.

### Removing financial barriers

Trane can help school districts take advantage of financing options required to implement much-needed HVAC upgrades and other energy conservation measures with minimal capital investment. As the improvements bring in the projected energy cost savings, the new equipment can pay for itself. This is how Trane has helped schools achieve over a billion dollars in operating improvements over the years.

### Calculate the savings

The energy conservation measures (ECMs) Trane recommends — and the resulting financial benefits — will be unique to your district and based on the condition of your buildings. In general, Trane has found that implementing upgrades to achieve performance improvements typically yields the following energy savings:

Lighting:	UP TO 10 – 15%	
Building Automation/Controls:	UP TO 5 – 15%	
HVAC upgrade:	UP TO 5 – 15%	
Chiller plant upgrade:	UP TO 5 – 15%	
Pump and motor replacements:	UP TO 5 – 15%	
Comprehensive energy-savings projects:	UP TO 20 – 30%	
Sub-metering program:	UP TO 2 – 5%	



## Making schools better

### Help your school building pass the test today and tomorrow.

America's schools waste 25 to 30 percent of the energy they consume.<sup>9</sup> Fortunately, the data that's being generated by your building controls provides a true indicator of whether or not your facility is among those wasting energy. In fact, Trane building professionals can transform this data into actionable insights that will optimize your building's performance and impact your bottom line through reduced utility costs. Data captured using Trane controls is the enabler to a host of performance-based services. And it's how you can make smart investment decisions that enhance your school operations — decisions that pay off as you create an environment that is healthier for students, easier on the environment and better for learning.

*Learn more ...*

Visit **Trane.com/k12schools** or contact your Trane account manager.

9. Gregory Kats, "Greening America's Schools Costs and Benefits," October 2006.



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