

# Daylighting Facts and Figures

## Education/Student Performance

- A study conducted by the Heschong Mahone Group for Pacific Gas & Electric Company tested 21,000 students in three states and found that those in classrooms with the most daylighting progressed 20% faster on math tests and 26% faster on reading tests in one year than those with the least daylighting.  
*(Heschong Mahone Group “Daylighting in Schools” Report at [www.h-m-g.com](http://www.h-m-g.com), 1999)*
- In October 2003, a study was conducted to validate and replicate the results of the 1999 Heschong Mahone Group study. It found that of the many variables studied (including classroom type, HVAC type, operable windows, etc.), only daylighting showed a strong and consistent correlation to improved learning.  
*(“Integrated Energy Systems: Productivity and Building Science” Report prepared for the California Energy Commission Public Interest Energy Research Program by the New Building Institute Inc., October 2003)*
- A study by the National Clearinghouse for Education entitled “Do School Facilities Affect Academic Outcomes?” reports appropriate lighting improves test scores and reduces poor behavior and that daylight fosters higher student achievement. Classrooms with effectively incorporated daylight yield lighter electric loads and reduce heating and cooling loads and are more popular with students and teachers. Districts, however, recognize the educational benefits far exceed these other benefits.  
*(School Planning and Management, February 2005)*
- Studies in Canada and Sweden noted improved student behavior and health, including fewer days of absence per year, in daylight classrooms. The Canadian study reported that daylighting also allowed for downsizing in heating, ventilation and air conditioning systems, which improved classroom noise levels, another perk for the learning environment.  
*(School Planning and Management, February 2005)*
- Daylighting played a major role in the design of Ronald E. McNair High School in Stockton, Calif., which was able to exceed Title 24 requirements by 26%, earning the largest award ever granted by the State of California, Office of Public School Construction (OPSC) and a substantial award from Pacific Gas & Electric through its Savings by Design program – about \$1 million total.  
*(American School & University, September 2005)*
- The potential for reduced electrical and HVAC operating costs may offset the initial increased capital costs for daylighting. However, the investment in daylight may yield even greater benefits in terms of student performance than the traditionally accepted investments in technology and furnishings.  
*(School Planning and Management, February 2005)*
- A survey by an Atlanta-based research firm of more than 1,000 public school teachers across the country found that 92% believed that classroom design had a strong impact on students’ learning and achievement. Approximately 89% believed classroom design was important for teacher retention, and



79% believed it was important for student attendance. Lighting was one of the top four design features teachers believed to impact the learning environment of the classrooms.

*(Boston Globe, September 5, 2001)*

- According to the University of Georgia, a lack of natural light can have a “jet lag” effect on students because it depresses their circadian rhythms.

*(National Post, September 8, 2001)*

- A study by photobiologist Dr. John Nash Ott, Ph.D. reported that “hyperactive children with confirmed learning disabilities calmed down completely and rapidly overcame their learning and reading problems while in the full spectrum lighting environment.” (Full spectrum lighting most closely mimics and produces the effects of natural daylight.)

*(School Planning and Management, February 2002)*

- A study of 90 school children in Sweden shows that lack of daylight can disrupt their chronobiology (internal body clocks) and result in significant psychological and physiological impairment. The study followed the health and behavior of children in classrooms with and without windows for an entire academic year, measuring the children’s production of cortisol (a stress hormone governed by the body’s biological clock). It concluded that work in classrooms without daylight may upset the basic hormone pattern and may in turn influence children’s ability to concentrate and cooperate and also eventually impact annual body growth and sick leave.

*(Report by the Parsons School of Design, New School of Social Research in New York analyzing 60 studies and articles on the topic of daylighting and productivity, 1999)*

*(National Renewable Energy Laboratory Report, “Daylighting in Schools: Improving Student Performance and Health at a Price Schools Can Afford,” 2000)*

- A series of schools built in Johnston County, N.C., replaced artificial lights with natural light, which resulted in between 22% and 64% energy savings as compared to typical neighboring schools. Since their construction, the schools have saved Johnson County Schools in excess of \$500,000 in energy bills. Additionally, students who attended the schools out-performed students in comparable non-daylit schools by 5% to 14%. The daylighting measures cost less than 1% of the construction budget and achieved a payback in less than three years.

*(Environmental Design & Construction, January/February 1998)*

*(U.S. Department of Energy’s Office of Building Technology, State and Community Programs Report, “Energy-Smart Building Choices: How School Administrators & Board Members Are Improving Learning and Saving Money,” 2002)*

- The North Carolina school [above] also witnessed reduced absenteeism among students, with 98% attendance (about 3% age points higher than the rest of the county).

*(School Planning and Management, January 2002)*

- An energy-efficient school district with approximately 4,000 students can save as much as \$100,000 per year in energy costs. Over a 10-year period, the savings can reach \$1 million. Spending less on operating costs enables school districts to redirect dollars to more critical educational needs, such as hiring additional teachers, purchasing new computers and instructional materials or paying for necessary capital improvements.

*(U.S. Department of Energy’s Office of Building Technology, State and Community Programs Report, “Energy-Smart Building Choices: How School Administrators & Board Members Are Improving Learning and Saving Money,” 2002)*



- Roy Lee Walker Elementary School in McKinney, Texas was constructed to incorporate extensive use of daylighting in every classroom. In addition to creating a bright, cheerful environment for students and teachers, the school was able to save the district \$40,000 to \$50,000 per year in energy costs. When school district zones were re-drawn, so many parents wanted their children to attend the daylit school that the school committed to build two more.  
(*National Renewable Energy Laboratory Report, "Daylighting in Schools: Improving Student Performance and Health at a Price Schools Can Afford," 2000*)  
(*School Planning & Management, March 2001*)
- Most Danish schools have excellent daylit classrooms, less for the students than for an awareness of how important it is to maintain the most productive and healthful workplaces for its teachers.  
(*Environmental Design & Construction, September 2002*)
- A Pittsburgh-area elementary school reported that after skylights were installed, attendance records rose from the state average of 93.5% to 95%, which earned the school an additional \$4,000 from the state that year.  
(*Pittsburgh Post-Gazette, February 15, 2000*)
- After a year of detailed observation of 90 eight-year-old students in Sweden, researchers found significant correlations between daylight levels, hormone levels and student behavior. The results indicated that work in classrooms without daylight upset the basic hormonal pattern. This, in turn, influenced the child's ability to concentrate or cooperate and also eventually had an impact on annual body growth and sick leave.  
(*Collaborative for High Performance Schools, website: www.chps.net, 2002*)
- A study reported in the International Journal of Biosocial Research on the effect of color and lighting on disciplinary incidents in elementary schools found that in some classrooms the use of natural light significantly reduced reported incidents of aggressive, disruptive and destructive behavior.  
(*Journal of Counseling & Development, April 2001*)
- The book collections in daylit libraries are used up to 50% more than in traditional library designs, according to the Daylighting Collaborative/Energy Center of Wisconsin.  
(*The Daylighting Collaborative website, www.daylighting.org, 2002*)
- Utility expenditures are a major item in every school district budget. In fact, the cost of utilities exceeds that of books and supplies and comes in second only to salaries. The annual cost of energy in schools is estimated at \$110 per student. Through better building design and the use of energy-efficient and renewable energy technologies, schools can save as much as \$50 per student per year.  
(*School Planning and Management, March 2002*)  
(*School Planning and Management, November 2001*)
- According to a report by the National Center for Education Statistics, 72% of the cost of energy in education buildings goes towards electricity, with the majority (56%) going toward lighting. America's K-12 schools will spend \$6 billion on annual energy costs, a cost that is second only to salaries and exceeds that of computers, supplies and books. Making a significant cut in electricity costs through daylighting can amount to substantial savings for other school expenses.  
(*School Planning & Management, November 2000*)

