Study Says Natural Classroom Lighting Can Aid Achievement

Daylighting and Productivity - CEC PIER

The HESCHONG MAHONE GROUP's recently completed study on daylighting and productivity has been summarized and reported by many in print, internet, radio, and televised media. Newspapers reporting on the study include The Washington Post, The Seattle Times, The Sacramento Bee, The London Daily Mail, The Christian Science Monitor, and many more. Over fifty newspapers, international and national, have issued an article on the study. The newswires of Scripps Howard News, Knight-Ridder Tribune News, and UPI also issued reports. Lisa Heschong has been interviewed by CBS and National Public Radio. Below are a few articles.

washingtonpost.com

By Kenneth J. Cooper
Washington Post Staff Writer
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School districts across the nation have scrambled to find a solution to dismal student performance on standardized tests, trying alternative curricula, different teaching methods, new textbooks, better trained teachers, smaller classes, tutors after school, Saturday sessions, even longer school years.

But for the most part, school officials have yet to take a close look at the physical space where learning takes place: the classroom. Could a partial solution to the achievement problem be to improve the lighting there?

A California architecture consulting firm thinks so, based on its study on the effect of classroom lighting on achievement levels. The study by the

Heschong Mahone Group based near Sacramento found that students who took their lessons in classrooms with more natural light scored as much as 25 percent higher on standardized tests than other students in the same school district.

The study, billed as the first rigorous one of its kind, appears to confirm what some school designers have asserted based on anecdotal evidence: children learn better under illumination from skylights or windows, rather than bulbs. The main theory for why this might be the case is that "daylighting" enhances learning by boosting the eyesight, mood and/or health of students and their teachers.

John B. Lyons, an Education Department official who monitors school construction, was briefed on the study last month. "It's one of the first studies that shows a clear correlation" between daylight and achievement, he said. "I don't discount that at all."

Joseph Villani, associate director of the National School Boards Association, said the study focused on the kind of "human engineering" issues that boards should consider in awarding design contracts.

"It's almost common sense if you look at what people prefer," Villani said. "Most people prefer to have some daylight."

While the Heschong Mahone study is the first to evaluate daylight's impact on learning, earlier research in Canada found student achievement gains were "significantly greater" in classrooms where artificial lighting most closely approximated sunlight. The 1991 study conducted for Alberta's Education Department, subtitled, "A Case of Daylight Robbery," examined the impact of different artificial lighting systems on elementary students' test scores, health and school attendance.

The new daylight study, commissioned by the Pacific Gas and Electric Co. out of an interest in potential energy savings, comes as the nation is on a school construction spree--spending $20.5 billion this year--to accommodate record enrollments. Its central finding runs counter to a

theory of school design popular in the 1970s: eliminating classroom windows so that students would not be distracted by goings-on outside.

Test results were analyzed for 21,000 students in Seattle, Fort Collins, Colo., and Orange County, Calif., areas with divergent weather patterns. Within each of the three school districts, the results of students in classrooms that let in varying amounts of daylight were compared.

More daylight appeared to have the greatest effect in the Capistrano district in Orange County. "We found that students with the most daylighting in their classrooms progressed 20 percent faster on math tests and 26 percent [faster] on reading tests in one year than those with the least," the researchers concluded. "Similarly, students in classrooms with the largest window areas were found to progress 15 percent faster in math and 23 percent faster in reading."

In Seattle and Fort Collins, the impact of daylight was smaller, raising scores from 7 to 18 percent. The study used a sophisticated statistical method called regression analysis to control for the social characteristics of students, variations in class size and other factors known to affect learning.

"We were completely taken aback at the magnitude of these findings. . . . I would have been delighted to find a 5 percent effect," said Lisa Heschong, one of the study's authors. "It's an eye opener."

The study did not attempt to explain why students in classrooms with daylight scored higher. Heschong, an architect, said the theories of other researchers that make the most sense to her are better vision--artificial light cannot exactly duplicate sunlight--and better morale.

"Kids see better, or teachers see better," she said. "It may be that teachers feel better, are more motivated by daylighting."

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Sunlight Gets A Good Grade

- *Studies: Natural Light Improves Productivity*
- *Energy Researchers Looked At Schools, Stores*
- *Body Chemical Melatonin May Be A Factor*

Tuesday, June 29,1999 - 01:12 PM ET

New York (CBS) A new study suggests that natural light actually helps children do better in school and helps stores sell more merchandise. The findings may change the way many buildings are designed, reports CBS News Health Correspondent Dr. Emily Senay.

The authors of the studies in California were not doctors, but architectural researchers who study buildings.

The research was conducted by an energy consulting firm for the California state Board for Energy Efficiency and Pacific Gas and Electric Co. The state utility's goal was to save on energy costs and determine whether sunlight increases human productivity. They were surprised at how strong the correlation was between daylight and productivity.

First, they examined student test scores and classrooms at three school districts in California, Colorado, and Washington state. They found that students in classrooms with the most daylight did 20 percent better on math tests and 26 percent better on reading tests than students at the same school in classrooms with the least amount of natural light.

In a companion study, the researchers looked at 108 stores that were part of a large chain. The stores were virtually identical in layout, except that two-thirds of the stores had skylights. They then looked at the sales figures for the various stores and determined that a skylight system increased sales by 40 percent.

The reports are the first large studies of this kind, and were not done by doctors or peer-reviewed by other experts. But the researchers were careful

to control other factors such as how affluent a community was or where stores and schools were located. They found that the association between sunlight and productivity were strong regardless of location.

It is not known why daylight might affect human productivity, but one possibility is that light has an effect on melatonin, a brain chemical that helps regulate sleepiness and alertness. Sunlight suppresses melatonin, making us more alert and full of energy. Conversely, too much of the chemical can make people drowsy or depressed.

Doctors suspect that melatonin plays a part in the "winter blues," when people feel more sleepy and depressed during the winter season. Some doctors use light therapy on patients who are depressed, having them sit in front of strong lights for a few hours each day.

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Sunlight could perk up kids' grades, store profits

By Carrie Peyton, Bee Staff Writer

Can a few beams of sunshine help lessons soak in?

A new study, one of the largest ever done on natural light in schools, suggests children learn faster and do better on standardized tests in classrooms with more daylight.

Learning rates were 26 percent higher in reading and 20 percent higher in math in rooms with the most natural light, researchers found.

A companion study found that sales were 40 percent higher in stores with skylights, compared with almost identical stores in the same chain without

skylights.

Psychologists and energy efficiency experts alike have long suspected that something as simple as sunshine may help people work more efficiently, learn more, call in sick less often and sell more.

The research, conducted by a Fair Oaks energy consulting firm for the state Board for Energy Efficiency and Pacific Gas and Electric Co., is one of the largest and most rigorous attempts to test those suspicions.

"My guess is this will make a huge impact on school design in the next few years," said Arthur Rosenfeld, a senior adviser for energy efficiency for the U.S. Energy Department.

While stressing he hadn't yet read the studies, Rosenfeld described the review team that evaluated them as "a star group," and said their level of certainty is "very, very impressive."

Rosenfeld heads a subcommittee of the National Science and Technology Council that will be reviewing hundreds of reports on the issue this summer, in an effort to separate hunches from evidence.

"Until fairly recently, the papers just haven't been convincing," he said.

What tidbits there were, were tantalizing.

A Wal-Mart store improved sales in areas lit by skylights, no matter what merchandise it put there. Wal-Mart never released any statistics for researchers to analyze, but within the past year it decided to build all its new stores with more natural light. Costco and HomeBase both have begun designing new stores with skylights, and Target has been studying their effect on energy use and sales.

"In retail there's been much more attention to this because of the economics," said Judith Heerwagen, a Seattle environmental psychologist who helped review the school data gathered by Fair Oaks architect Lisa Heschong.

"It's absolutely intriguing work," Heerwagen said. "Her results were pretty consistent across the sites, which suggests there clearly is something going on here."

The Heschong-Mahone Group brought in statisticians to analyze test scores of more than 21,000 elementary school students in three Western school districts.

In the Capistrano Unified School District in Orange County, where children were tested at the beginning and end of each school year, a comparison of 750 classrooms showed more improvement in those with the most daylight.

In those classrooms, students scored 2.3 points higher in reading and 2.5 points higher in math than students in the rooms with the least daylight.

Over the course of the school year, in all lighting situations, the district's students on average increased their scores 8.8 points in reading and 12.5 points in math.

In the Seattle Public School District, where students were tested only once a year, those in rooms with the most daylight had 13 percent higher reading scores and 9 percent higher math scores than those in the least. Similar testing in Fort Collins, Colo., showed 7 percent higher scores in reading and math.

Heschong said she didn't know what might be causing the effect.

"Daylight is a very complex thing. It affects how we see, and it also affects us biochemically" in ways that alter alertness, she said.

People also just plain like windows.

"I know I work better when things are open and bright," said teacher Kelly Baker.

She said her fourth-graders seemed more attentive and better focused after they moved from a nearly windowless portable to a bright, newly

remodeled classroom at John Holst Elementary School in Fair Oaks.

The workplace preference for windows is so strong that in Europe, "you're not allowed not to have access to daylight. It's considered inhumane," said Eleanor Lee, a specialist in building technologies at the Lawrence Berkeley National Laboratory.

The new daylight research, detailed in twin reports finalized last week, is "one of the better recent studies that indicates there are effects here worth looking at," said Steve Selkowitz, who coordinated the scholarly review of the findings.

"People have tried to study it on a smaller scale, but doing it on a larger scale with more data sets is important," he said.

Selkowitz, head of the building technologies department of the Environmental Energy Technologies Division at the Lawrence Berkeley lab, cautioned that there is "a complicated set of pathways between a cause and an effect."

Virtually everyone, he said, would agree that "the single most important parameter affecting student scores is the teacher."

Steve Looper, a computer teacher at James McKee Elementary in Elk Grove, said he has worked in a range of classrooms and never seen a daylight effect.

"There are a lot of other factors that would improve student performance a whole lot more," he said, such as "getting kids to have enough sleep the night before or to have breakfast in the morning."

Still, those interested in energy savings from the building technique called "daylighting" are expecting more research as fascination with the subject continues to grow.

Interested parties include utilities, which have long advocated buildings that use skylights, well-placed windows, reflecting surfaces and other

designs that let people conserve energy by turning off electric lights.

The Sacramento Municipal Utility District's light-drenched customer service center saves SMUD the equivalent of about $56,000 a year in electric bills, an independent study found.

While the energy conserved by daylighting makes a big difference, nationwide, that's not as exciting to builders or building owners as its effects on people inside, said Selkowitz.

"Very generally, if you look at costs in very round numbers, energy costs about $2 per square foot per year, and people cost about $200 per square foot" in an office building.

So even a tiny improvement in productivity or sick time will pay off far more quickly than energy savings, he said.

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