

# Classroom Toolbox for Green Retrofit of U.S. Schools

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*Photo: Ihab Elzeyadi, professor of architecture at the University of Oregon, looks at a model in his lab. The impact of exterior changes to block bright light and reduce energy consumption is being measured by a light meter inside the model. Credit: Photo by Jim Barlow*

According to academic estimates, there is something like 20 billion square feet of existing U.S. public school buildings. And nearly half of this space (40 percent) is classified as providing "poor environmental conditions" for the 15 million students who make use of it. There is increasing attention on new construction of schools going green. But what about the retrofit of existing schools so they too far more energy efficient?

Ihab M.K. Elzeyadi, a professor of architecture at the University of Oregon, is determined to help local officials and school planners accomplish this by developing a "Green Classroom Toolbox" for architects and planners that will assist in their energy retrofits and modernization plans.

"I am alarmed by the state of our schools," says Elzeyadi "We have 20 billion square feet of existing space that are in worse conditions than our prisons, and this is where students are expected to learn." In San Antonio, he noted how new-construction planning often incorporates green ideas to reduce energy use and carbon footprints, but "existing classrooms have been largely ignored." Also missing, he said, are data on direct impacts human performance and student learning.

"We need to be able to understand not only how buildings can conserve energy but also what impacts these efforts have on humans inside them," he added in a recent statement. "If we can have two sides of the story, then we can have triple benefits for people, profit and planet."

Under the American Recovery and Reinvestment Act of 2009, school districts will have access to federal funding to modernize and green their schools. Elzeyadi says his work can provide school designers and officials with the needed guidelines to direct this process the right way.

The toolbox includes a checklist of 20 best practices, pared down from a series of meetings in Portland, Salem and Eugene, all in Oregon, where 24 representatives of K-12 schools, architects, engineers and facility managers generated 128 ideas. Elzeyadi's team surveyed literature on health impacts of going green and then ran simulations on a prototypical elementary school building.

In addition to the checklist, the toolbox features a prioritization guide that also provides comparative analyses and a guide that links best practices to findings on health and performance.

The project began almost two years ago after Elzeyadi collaborated on a particular school project. "I found there had been lots of guidelines and best practices about new construction but not existing structures. I thought it was time to do that for retrofits." Before joining the University of Oregon faculty in 2001, he had worked as a project manager for the Heschong Mahone Group of Sacramento, Calif., where, he contributed to studies on daylighting effects on buildings and human performance.

"You can't drastically change poor early design decisions, but our analysis shows that some minimal retrofits in the classroom can have drastic impacts," Elzeyadi said.

More information is available from Elzeyadi at [ihab@uoregon.edu](mailto:ihab@uoregon.edu)

Online videos: About the Toolbox: [http://www.youtube.com/watch?v=S5La\\_Bw2f2w;](http://www.youtube.com/watch?v=S5La_Bw2f2w;)  
How the project started: <http://www.youtube.com/watch?v=w--glszgMbY>

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