

Achievement by Design

Buildings and classrooms play a role in how students learn, but while amenities are nice, don't let the frills overshadow your district's instructional goals

A few years ago, a fourth-grade teacher in central Maine brought photographs of her classroom to our graduate research course. She'd recorded rainwater seeping through the ceiling and dripping into plastic buckets, and she'd taken close-up pictures of bare wires, broken electrical sockets, cracked tiles, and exposed insulation.

I decided to see the school for myself, so I arranged a walk-through with the teacher and principal. They pointed out structural problems and health hazards throughout the school. And they introduced me to teachers who managed to

teach and students who struggled to learn in those appalling conditions.

A third-grade teacher and her students, suffering from burning, watering eyes, had evacuated to a makeshift classroom in a corridor. In a north wing, a fifth-grade teacher and her students shivered through a math lesson as winter winds howled through ill-fitting windows.

On my way home, I wondered how these teachers and students would fare in a modern, well-maintained school without any environmental roadblocks to teaching and learning.

No bad seats

Franklin Hill, whose company specializes in school facilities, says a school's design can help or hinder instruction. Certain things, such as controlled temperatures and non-glare natural lighting, can help if they're designed properly.

But attractive classrooms with adequate space, good acoustics, and areas for group and independent studies are "only the start," Hill says. Schools should never be judged solely by a pleasing appearance, or by an Olympic-size pool, television studio, and other expensive extras. Architects and school officials should design schools that "measurably and substantially" increase fair and equitable learning opportunities for all students, Hill says.

For example, classrooms should be devoid of so-called bad seats that can obstruct learning.

In a design analysis conducted in primary grade classrooms, youngsters were asked to identify three shapes — square, circle, and rectangle — projected on a screen at the front of the room. Depending on the "angle of incidence" from their desks to the screen, some saw the square as a rectangle, the circle as an oval, and the rectangle as a square. Hill says students in peripheral zones often have difficulty discerning alphabet letters, such as the letter "E" from "B," and numbers on graphs.

He's found similar problems in middle and high school science labs. Some students are assigned to tables 40 feet away from a lab lesson presented on instructional television or whiteboard. But, based on the physics formula of volume lowering with the inverse square of the distance from the sound source, students who sit or stand 20 or more feet away from the screens have more than 50 percent reduced audibility and visibility. Solutions include clustered seating and multiscreen media.

Teachers as placemakers

Promises that new schools will raise school achievement abound.

But only a portion of student achievement can be attributed to school facilities, says Jeff Lackney, architect with the University of Wisconsin-Madison's School Design Research Studio. He says facilities are part of a "complex ecology" that includes factors such as school climate, parental involvement, student behavior, motivation to learn, and, most importantly, teacher quality.

New classrooms, designed to be



more expansive and flexible, are often underused. In their recent study, Lackney and Paul Jacobs, with the University of Texas at San Antonio, discovered that most teachers are untrained and unskilled as “placemakers”—able to manipulate physical space to increase student achievement.

For instance, in some new schools,

teachers continue to seat students in straight rows and keep paper, markers, and other materials under lock and key, even during project-based lessons. In classrooms where traditional methods prevail, expensive high-tech equipment often goes unused.

How can teachers become better placemakers? Lackney and Jacobs say

teachers should think like architects and design classroom space to support instruction:

- Define interest areas, such as biology centers devoted to botany and zoology.

- Organize space by activities, such as providing writing nooks with supplies for writing and illustrating.

- Separate incompatible activities, such as independent reading and dramatic play areas.

- Provide visual clues to learning centers, such as soft lighting and themed book displays.

- Establish traffic and movement flow throughout the room.

- Locate materials in places accessible to students, and place reference items, such as alphabet letters and chemistry symbols, at eye level.

- Create space where students can retreat when they need thinking time or “down time.”

Evaluate after you move in

Building and renovating schools is a complicated process that shouldn't end when architects and contractors receive their final payment.

A year after teachers and students move into a new or renovated building, school officials should conduct a post-occupancy evaluation—an appraisal of the building's condition and an assessment of teaching and learning in the new facility.

These design principles developed by the U.S. Department of Education, and endorsed by the American Institute of Architects, the Council for Educational Facilities Planners International, and Urban Educational Facilities for the Twenty-First Century, should be included in a post-occupancy evaluation:

1. Teaching and learning for all students

- Instruction is based on learning theories and research-based practices.
- Students are actively engaged in problem-solving, cooperative learning, and authentic, interdisciplinary learning.
- Students are encouraged to learn, and demonstrate their learning, according to their multiple intelligences and learning styles.

2. School as the center of the community

- Facilities are open to residents after hours, evenings, and weekends.
- Programs provide lifelong learning and training to students and adults.
- Schools invite parents and residents to be involved in the schools.
- Buildings are designed to complement a community's architectural style.

3. Health, safety, and security

- Facilities are attractive and well-maintained.
- Classrooms and other learning sites are designed to accommodate individuals with special needs.
- Safety and environmental codes are met.
- Indoor environmental quality is consistently healthy.
- Traffic patterns in classroom and corridors allow smooth flow of movement.

4. Maximum use of all available resources

- The school uses the surrounding physical environment and community sites as learning spaces.
- Natural and historic facilities and sites are preserved, maintained, and used.
- New technology is used appropriately to help all students learn.

5. Facilities for the present and the future

- The school's design can be modified in the years ahead.
- Classrooms and other learning spaces are flexible and adaptable for many types of learning.
- The school is built to accommodate rapid changes in technology.

Improving achievement through design

The truth of the matter, says Prakash Nair, an architect and president of Urban Educational Facilities for the 21st Century, based in New Jersey, is that new schools are appealing and more comfortable, but many continue to simply “warehouse children.”

He raises a probing question: How much of the more than \$20 billion spent annually to build and renovate schools actually improves learning? Politicians, school officials, and school designers often proclaim that new schools will raise student achievement, but they're hard pressed to explain how or why.

Nair finds that most new schools persist in using a “schooling model,” where teachers impart information through lectures and worksheets, instead of a “learning model,” where students are engaged and actively learning.

Learning theory should dictate school design, Nair insists, but he points out there's no “precise prescription” or standard model for a new school. He recommends that architects, school leaders, and community residents review up-to-date research on teaching and learning

Adapted from “The State of Post-Occupancy Evaluation in the Practice of Educational Design,” by Jeffery Lackney. Paper presented at the Environmental Design Research Association, July 5, 2001.

before sketching plans for a new school. They should consider these possibilities:

- Learning studios with abundant daylight, flexible furniture, and space for group projects.
- Open areas such as atriums and learning streets — instead of corridors — to encourage social interaction.
- Project rooms with high ceilings, worktables, and specialized equipment for inventing, creating, and building.
- Multiage groups where students mix and match according to interests and aptitudes.
- Outside learning where students work on community service projects and use community sites such as museums and libraries as classrooms.
- Exercise areas, meeting rooms, and other facilities suitable for community use.
- Teacher workrooms designed for team meetings and collaborative planning.
- Quiet areas that provide space to think and reflect.
- Technology that supports after-school learning, such as online courses, homework networks, and connections to schools in other towns and countries.
- Classrooms that can adapt and use future technology.

‘Fallen off the agenda’

The issue of improving schools with crumbling infrastructures has “fallen off the agenda” since the 2000 elections, says Sara Mead, policy analyst with the 21st Century Schools Project, a division

of the Progressive Policy Institute in Washington, D.C. Most policy makers have shifted their focus from improving schools to improving student achievement, she says.

How bad is the problem of worn-out schools? One-fourth of the nation’s schools are overcrowded and in poor condition. And some 3.5 million students attend schools that are in “very poor” or “nonoperational condition.” In 2004, the American Society of Civil Engineers reported no improvement in the overall quality of schools since 2000.

It’s not just inner city schools that are crumbling. For three years I’ve kept a file of school board minutes, reports, and editorials about a small district’s building project. At first the school board and administration proposed building a new district complex outside the village limits. To make their case, they held tours to show mold-infested closets, clunky boilers, and dilapidated classrooms. And they promised that a shiny new high school, middle school, and elementary school would raise student achievement.

Taxpayers were angry that the school board had allowed maintenance to fall by the wayside for several years. Some suspected subterfuge—a stealth move by the superintendent and board to force the community to build new schools.

And there was community consternation when the blueprints were made public. Opposition groups insisted the designs were “off scale”—much too

large and far too expensive for a district with dwindling enrollment and an increasing dropout rate. Many citizens rejected the site plan, arguing that transportation costs would be exorbitant. And many challenged claims that elaborate computer labs and new sports fields with artificial turf and stadium lighting would boost achievement.

School officials regrouped and submitted a scaled-back project which, after much public wrangling, voters narrowly approved. At this point, the district plans to extensively renovate and upgrade the schools. The sports fields and computer labs were cut back but not eliminated.

The day of the vote I read a report by Eric Hanushek, a researcher with Stanford University’s Hoover Institution who specializes in the economics of new schools. Hanushek said there’s no strong evidence that “putting money into gold-plated school facilities” will improve student achievement.

I hope you will remember his advice when it comes time to design a new school or renovate an old school. Schools should never be a monument to adult egos, and they should never be built on false assumptions or on unworthy promises. Schools should be safe and healthy places where teaching is high-quality and all children learn. ■

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