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ABSTRACT

Researchers have discovered that the physical condition of a school can make a difference in student achievement. To further this knowledge, seven articles on school environments, ranging from school repair to strategies for infrastructure funding, are presented. The first article, "The Cruel Conditions of Our Nation's Schools," (Michael R. Williams) describes how deferred maintenance in school buildings has raised school repair costs to $112 billion over the next 3 years. Some of the questions raised are addressed in the second article, "Probe Roundtable", which reports on a discussion of experts on learning and school facilities and focuses on questions that must be answered so as to help policymakers and community leaders manage their schools' facility needs. School design and consensus is covered in the third article, "Design and Consensus," (Julie Miller) and features an example of an innovative planning process. Ways in which architects and educators have translated research on school reform into workable plans for school facilities are discussed in "School Facilities Fit for Reform" (Anne C. Lewis), followed by details on how color, lighting, and other elements can be combined to aid student achievement in "School Sense" (Ullik Rouk). Many communities need infrastructure funding and ways in which to raise funds, without seeking voter-approved bond issues; these strategies are detailed in "The Question That Won't Go Away" (Lynn W. Zempel). The next article, "Managing in the States" (Brian Curry), describes how school are being forced to find creative solutions to the increasing demands being placed on aging schools. The publication concludes with "A Role for the Federal Government in School Infrastructure?" (Neil Strawser). (RJM)

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Designing School Facilities for Learning

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PROBE

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Designing School Facilities for Learning

PROBE

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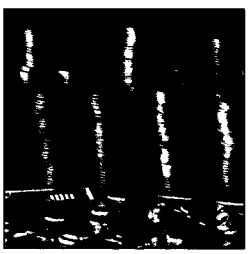
Contents
Designing School Facilities for Learning

PROBE is published for education policymakers and others on the forefront of education policy. Its topics are deliberately chosen to highlight new practices and research findings that require policy attention or, where the research base itself is too weak to inform policy adequately, to stimulate further inquiry. In other words, PROBE is about both what we know and what we don't know but need to find out.



Our Schools Are Symbols of What We Value

Not long ago, health care research began to show a link between the hospital environment and patients' healing. Researchers found, for instance, that patients who recuperated in identical rooms, except that in one room there was a window from which the patient could see a tree, healed at different rates. The patient with a view of the tree recovered more quickly. The tree was a connection to the outside world; it relaxed patients, reduced stress, and gave them the motivation to ward off their ailments to whatever extent possible.

At the time, the fact that something as simple as a hospital environment made a difference in the healing process was a startling revelation.

Now we are discovering that a similar relationship exists between the environment and learning. The physical condition of our schools can make a difference in student achievement.

In the late 1970s, architects coined the term, "pattern language," to describe the messages that buildings communicate about the function they perform and the way their design influences human behavior. There is an architectural "pattern language" that guides human action and in turn, makes learning environments either productive or non-productive.

Schools that don't have places for quiet study or small group work reinforce a "crowd" mentality that squelches individual curiosity. Schools that are so large that students seldom see a familiar face foster alienation and lack of investment and pride in both the place and its function.

Pattern language also embodies the value communities place on learning. In communities that value responsibility, tolerance, and quality work, the walls of the school often celebrate students' achievement. Where the community is mired in apathy or prejudice, or feels disenfranchised, the walls are likely to be splashed with racist and sexist graffiti.

Successful schools are a glue in our civic infrastructure. They strengthen a community's sense of identity, coherence, and consensus. Inviting spaces within the school facility nurture dialogue about children and the future of the community. The school's "pattern language" supports it as a place where students learn about collaboration and the common good.

Communities know instinctively that not having such a space at their core seriously curtails their capacity to sustain on-going civic deliberations about their own destiny. That is one reason why school closing decisions arouse such passion and pain.

Using architectural elements as tools to enhance children's learning is

a relatively new education reform idea. The old "egg-crate" design with its center hallway "spine" connecting classroom "pockets" no longer serves today's new instructional techniques, needs for flexible space, and technology. Fortunately, innovative ideas are taking form that will help us create better learning spaces.

These ideas include redesigning the layouts of old facilities to support new teaching approaches, as school officials did in Baltimore. A few years ago, Patterson High School earned the dubious distinction as one of the worst schools in Maryland. As part of a determined effort to turn that condition around, school planners created "academies" within the school, each with its own "front door" and small enough to provide students with regular interactions with teachers and peers and a strong sense of school identity. Corridors and classrooms were cleaned up and swathed with symbols of school pride. A newly opened snack shop is an operational base for guidance counselors and keeps hungry teenagers from leaving the school for the lure of the streets.

Using cutting-edge knowledge and research about learning to design and construct new school facilities — including making decisions about the size of buildings and the arrangement of space, color, and lighting — has a long term payoff for our students, our communities, and our country. But for that payoff to become real we must be equally as imaginative and bold in designing new instruments with which to finance the repair and construction of our schools.

School buildings are a tool in the enterprise called learning, and, like any tool, they can help or hurt that enterprise. We can't control all the influences that affect a child's learning. We must take each child as he or she comes to us. But we can control the kinds of learning facilities to which we send our young.

That is what this issue of PROBE is about.

Dena G. Stoner
President

The Cruel Conditions of Our Nation's Schools

by Michael R. Williams

Years of neglect have raised the cost of school repair to $112 billion over the next three years. How did it happen?

In the middle of last August, District of Columbia Superior Court Judge Kaye K. Christian ordered that the start of school in 13 Washington, D.C., schools be delayed because of fire code violations. Local furor ensued. District citizens and the U.S. Congress decried past decisions by the school administration to defer maintenance of leaky roofs, buckling floors, broken down plumbing, and outmoded electrical systems. And despite the fact that by September school officials had made emergency repairs that allowed all but three of the schools to open on schedule, the plight was viewed as another embarrassment to a District political system already beset with its share of crises.

Such physical disrepair is not attributable solely to schools in Washington, D.C. It is an ongoing crisis in schools across the country. In a recent series of reports, the General Accounting Office (GAO) projects that investment in public schools needs "to be increased by $112 billion to repair or upgrade facilities to good overall condition over the next three years." That amounts to $37 billion per year, seven times what school districts were actually able to budget for that purpose. At the current pace, without a massive infusion of maintenance funding, observers warn that buildings will degrade faster than they can be maintained.

The GAO reports ominously cite public concern that while laws require children to attend school, some school buildings may be unsafe or even harmful to children's health. At least one third of all districts in the country have one or more buildings in need of extensive repair or replacement; 58 percent of the nation's approximately 80,000 schools experience environmental problems such as heating, lighting, ventilation or security; and more than a third lack the electrical power to support educational technology. More than half the schools surveyed indicated a need to spend money to improve accessibility in order to comply with requirements of the Americans with Disabilities Act.

Schools in both "good" and "inadequate" condition exist in every state. Central city

schools are generally in worse condition than schools in suburbs.

Rural schools are not far behind city schools in the number of repairs they need.

How did our schools get this way? Or perhaps more to the point, why did we let it happen?

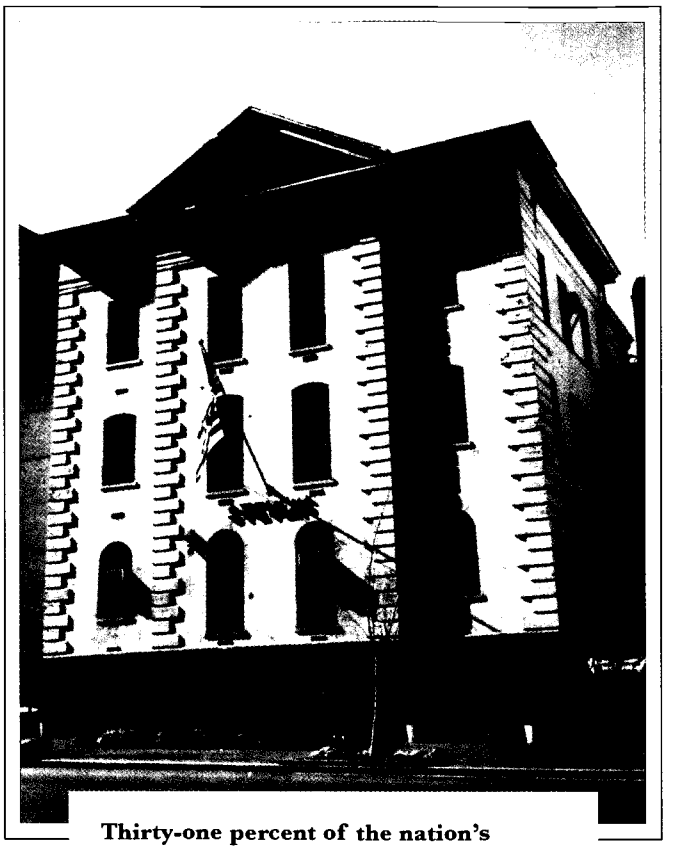
Early Commitments

Public investment in education was an unquestioned tenet of the United States' postwar commitment to democracy. The nation embraced the G.I. Bill of Rights and, albeit haltingly, developed the consensus to redress the historical inequities in our education system. In 1954 *Brown v. Board of Education* provided a platform for Chief Justice Earl Warren to offer an eloquent and widely shared vision of public schooling in the United States:

> Today, education is perhaps the most important function of state and local governments. Compulsory school attendance laws and the great expenditures for education demonstrate our recognition of the importance of education to our democratic society. It is required in the performance of our most basic public responsibilities, even service in the armed forces. It is the very foundation of good citizenship.

Chief Justice Warren went on to say that, "such an opportunity, where the state has undertaken to provide it, is a right which must be made available to all on equal terms."

The viewpoint that public education was "the most important function of state and local governments" confronted school districts with extraordinary new burdens as democratization, demographics, and international politics visited the schools with increased obligations. Local school systems, which had graduated less than 1.2 million students in the 1949-50 school year, began to see the influx of the postwar "baby boom." By 1971-72, the year of the last great peak in elementary and secondary school enrollments, the number of high school graduates had nearly tripled, to more than three million.



Thirty-one percent of the nation's schools are more than 50 years old.

In those two decades, as well, public schools became laboratories for national desegregation and pipelines to a future that seemed to demand a college education. In the opening two weeks of the school year in 1957, President Eisenhower sent troops to Little Rock, Arkansas, to protect school inte-

gration and the Soviet Union launched the first earth-orbiting satellite. The United States would enforce broadening the franchise for quality public education. It would also insist that, especially in science and mathematics, curriculum improvements be effected immediately. Public elementary and secondary schools, whose mission and governance had traditionally been local, were confronted collectively with massive national mandates for change.

To accommodate the postwar increase in school-age population, local communities embarked on a building program of great magnitude. The challenges of epitomizing social democracy and accelerating technical education to surpass Cold War competition made passing local bond issues for school construction a national imperative. Forty-three percent of the schools operating today were constructed in the 1950s and 1960s. Of the remaining schools, 31 percent are more than 50 years old; roughly a quarter opened their doors within the past 25 years.

Decline and Distrust

The pressure on facilities lessened with the passing crest of the baby boom. But the decline in public school enrollment between 1972 and 1985 occurred during rocky economic times, characterized by widespread public expressions of pessimism and distrust, particularly of government. Education agendas and expenditures became suspect. The "taxpayer revolt" of the 1970s hit school districts with particular ferocity, capping school budgets at a moment of price inflation throughout the national economy. At the same time, eroding urban tax bases sapped urban school districts' real revenues. Factory closings and the movement of both residential and business taxpayers to suburbs impoverished many urban school districts even more. Central cities, increasingly, became educators of the poor. The GAO notes that:

> Beginning in the 1970s, litigation in many states highlighted disparities in school districts' ability to raise money for public education. Court decisions resulted in many states increasing funding levels and playing a larger role in lessening financial disparities between rich and poor districts. Although these decisions have pertained mainly to the state's role in providing for instruction . . . by 1991, state funding for school facilities totaled more than $3 billion or about 20 percent of all funds used for public school construction.

The decline in public school enrollment ended in the mid-1980s. The U.S. is now in the middle of what Education Secretary Richard W. Riley recently described as a 20-year trend of rising enrollments that is projected to reach 54.6 million students by 2006. Such a surge in the number of students will demand the construction of 6,000 new schools in the next ten years, at a cost of at least another $60 billion to add to the $112 billion required to repair present facilities.

The difference is, whereas America in the 1950s was willing and able to embrace the challenge of building the educational facilities it needed, America in the 1990s may not be. The U.S. no longer stands as the economic colossus it was immediately after the Second World War. Some say it has lost its sense of public purpose. Certainly, the constituency for public education is splintering and doubting.

The states now provide almost half the funding for elementary and secondary educa-

PERCENT OF SCHOOLS WITH INADEQUATE BUILDING FEATURES

State	HVAC	Electrical Power	Electrical Lighting	Life Safety Codes	Roofs	Exterior Walls, Finishes, Windows, Doors	Interior Finishes	Plumbing
Alabama	42.7	24.5	30.5	24.6	29.8	29.3	30.3	38.0
Alaska	44.6	49.0	41.3	29.5	33.0	37.7	34.8	33.4
Arizona	37.7	36.1	31.6	28.0	30.2	20.9	23.0	39.7
Arkansas	19.1	14.1	18.6	9.4	22.3	20.2	14.9	22.1
California	41.2	32.1	42.5	20.8	40.5	41.7	46.5	40.9
Colorado	40.8	31.4	27.4	16.7	26.2	24.1	26.5	27.9
Connecticut	32.1	29.1	21.4	27.7	32.3	22.8	22.1	25.1
Delaware	48.0	43.7	37.6	25.6	36.4	35.5	37.7	49.6
District of Columbia	66.2	49.9	53.0	50.7	67.4	72.2	46.3	64.9
Florida	40.1	27.5	26.7	8.6	23.3	24.7	32.5	31.7
Georgia	16.3	17.4	13.7	9.9	23.7	14.4	11.1	17.7
Hawaii	36.8	27.3	16.8	5.0	15.5	15.8	17.3	19.9
Idaho	37.4	28.9	23.8	19.5	30.6	18.3	18.5	31.8
Illinois	45.0	28.3	27.9	24.0	22.6	29.8	25.6	37.5
Indiana	43.3	33.9	28.6	24.8	15.1	21.5	21.1	29.1
Iowa	24.6	17.3	21.7	12.8	21.4	15.6	16.1	21.2
Kansas	42.1	31.5	25.2	18.1	27.8	27.0	26.5	32.4
Kentucky	38.3	25.0	27.4	19.7	34.2	26.2	22.6	24.5
Louisiana	27.3	30.4	25.0	28.5	28.4	31.3	29.6	24.8
Maine	36.7	24.1	17.9	25.1	38.4	33.1	23.8	30.5
Maryland	50.0	35.4	34.2	22.4	33.3	30.1	27.1	26.2
Massachusetts	48.0	34.4	29.7	22.0	41.2	41.4	29.7	36.5
Michigan	28.9	24.2	23.1	13.4	20.3	22.2	18.3	21.8
Minnesota	41.3	26.3	22.7	27.5	31.7	29.5	25.0	32.9
Mississippi	26.0	20.5	19.4	16.5	27.2	22.1	21.2	28.2
Missouri	36.2	23.9	18.5	9.5	20.5	23.3	22.4	29.8
Montana	20.9	13.8	15.1	13.5	18.9	14.7	14.8	19.2
Nebraska	35.7	20.9	19.8	18.1	19.9	23.1	19.0	23.5
Nevada	29.6	18.0	15.5	14.9	18.2	27.4	18.9	15.8
New Hampshire	48.6	32.6	20.0	16.4	19.6	35.9	24.3	28.1
New Jersey	32.9	20.8	20.4	14.9	25.1	18.4	18.3	19.7
New Mexico	38.5	39.9	37.6	22.0	28.8	22.5	21.2	42.6
New York	36.5	18.5	13.0	11.0	30.6	37.9	23.1	27.8
North Carolina	33.7	19.2	19.9	20.1	24.7	21.9	19.4	21.5
North Dakota	32.1	18.9	17.6	14.6	18.8	22.5	18.4	28.1
Ohio	47.5	45.7	33.5	29.8	32.6	34.5	20.8	39.4
Oklahoma	35.7	27.3	26.3	24.3	25.7	21.8	22.1	31.6
Oregon	46.9	36.4	29.2	14.8	35.6	31.4	17.2	40.8
Pennsylvania	27.5	15.6	15.0	12.0	18.9	13.3	17.5	19.5
Rhode Island	35.3	33.8	33.5	14.3	22.6	34.7	19.2	27.3
South Carolina	24.6	24.0	22.2	13.9	27.6	24.3	26.0	28.2
South Dakota	29.0	20.6	16.1	21.6	25.7	21.6	22.0	25.0
Tennessee	35.7	18.5	15.6	21.4	21.5	12.6	11.1	21.0
Texas	25.8	17.5	18.4	15.8	22.6	16.4	18.5	26.4
Utah	44.3	24.7	35.0	25.7	31.8	21.1	14.2	32.7
Vermont	39.6	20.1	21.0	16.9	20.9	18.3	19.6	18.6
Virginia	35.2	24.5	23.5	18.5	31.8	25.2	17.8	32.1
Washington	51.9	36.2	37.9	36.4	31.7	33.5	30.9	39.4
West Virginia	56.9	28.9	35.9	30.7	25.8	43.3	36.8	37.8
Wisconsin	27.7	26.1	17.5	11.8	17.5	23.1	19.0	23.5
Wyoming	24.7	18.6	14.0	14.7	24.0	18.0	13.5	18.9

Source: General Accounting Office, *School Facilities: America's Schools Report Differing Conditions,* 1996, 39–42.

tion in this country, but construction financing remains principally a local responsibility. Only 23 states collect even some data on the condition of school buildings. And while 40 states do provide some assistance for facilities construction — ranging from $6 per student in Montana to more than $2000 per student in Alaska — state support adds up to only 20 percent of what schools need. About half that construction budget is used for new buildings and the other half for maintenance and repair of existing facilities.

Deferred Maintenance

Part of the problem, the GAO acknowledges, is how schools were built in the first place. Schools "built in the early years of this century — or before — frequently were built for a life span of 50 to 100 years while more modern buildings, particularly those built after 1970, were designed to have a life span of only 20 to 30 years," one of its reports says.

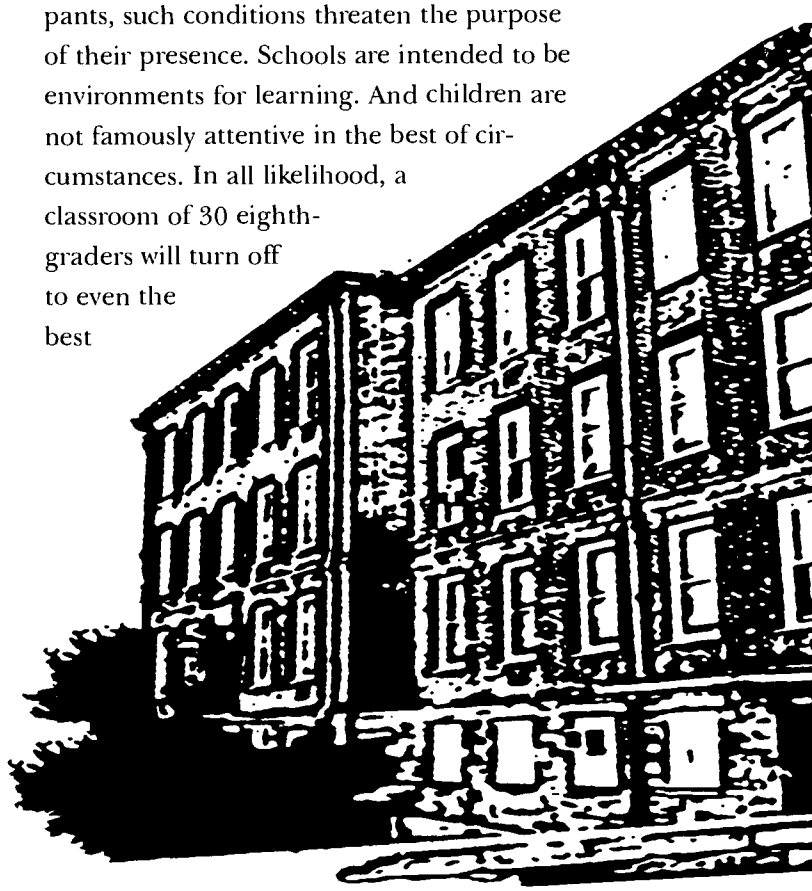
In short, more than 60 percent of America's schools are reaching the end of their predicted lifespan. The nation is behind schedule for a building program of this magnitude.

While the simple age of the structures tends to contribute to maintenance expenses, regular maintenance influences a school condition more than how old it is. "A major factor in the declining condition of the nation's schools," the GAO continues, "has been decisions by school districts to defer vital maintenance from year to year due to lack of funds."

School district officials told the GAO that anti-tax sentiment among voters and the passage of property tax limitations have seriously hampered efforts to raise funds for repairing and renovating school buildings. One in three districts reported having an average of two bond issues fail in the past 10 years.

While deferred maintenance has become standard as funds are consumed for emergency repairs, the practice inevitably compounds physical defects and leads to more expensive repairs or conditions that are, in fact, hazardous to students and teachers. Even the most solid and best maintained pre-World War II school buildings were not built with the environmental safeguards that are considered essential today. Asbestos and lead paint were standard building materials. Air-conditioning was nonexistent in school construction. The electrical service required to serve computers and the array of other contemporary machines was also, of course, undreamed of. The best school structures, even if maintained unerringly, were designed for another era.

But even when malfunctioning air-conditioning systems or plumbing does not threaten the health of a building's occupants, such conditions threaten the purpose of their presence. Schools are intended to be environments for learning. And children are not famously attentive in the best of circumstances. In all likelihood, a classroom of 30 eighth-graders will turn off to even the best



teacher when air-conditioning fails and the temperature hits 90 degrees Fahrenheit. Nine-year-old children will be inattentive and disruptive when they have to wear coats in class to ward off cold or when there is a continuous drip through the roof.

Unready for Technology

The demographic strain on facilities that are already overcrowded and physically exhausted has, in recent years, been joined by another key element in considering the adequacy of school facilities. Technology. The GAO poses the following proposition:

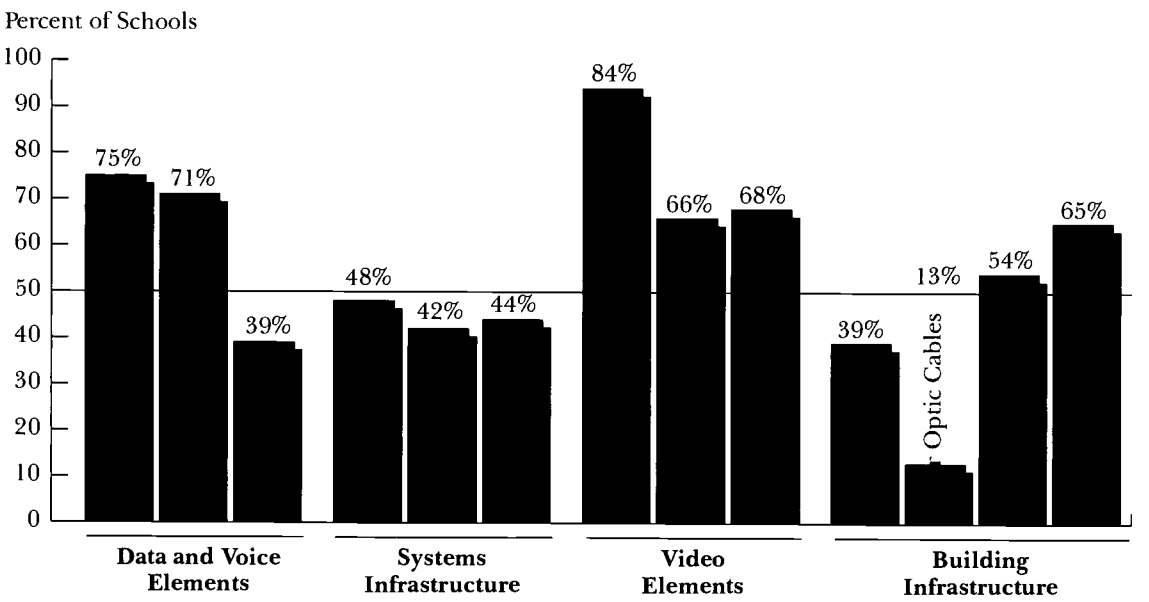
Rather than uniform-sized classrooms with rows of desks, a chalkboard, and minimal resources such as textbooks and encyclopedias, schools prepared to support 21st century education would have:

- flexible space, including space for small and large-group instruction;
- space to store and display alternative student assessment materials;
- facilities for teaching laboratory science, including demonstration and student laboratory stations, safety equipment, and appropriate storage space for chemicals and other supplies; and
- a media center/library with multiple, networked computers to access information from outside libraries and information sources.

The description continues with a vision of schools that would operate year-round, 24-hours a day if necessary, with an array of networked computers and communication facilities.

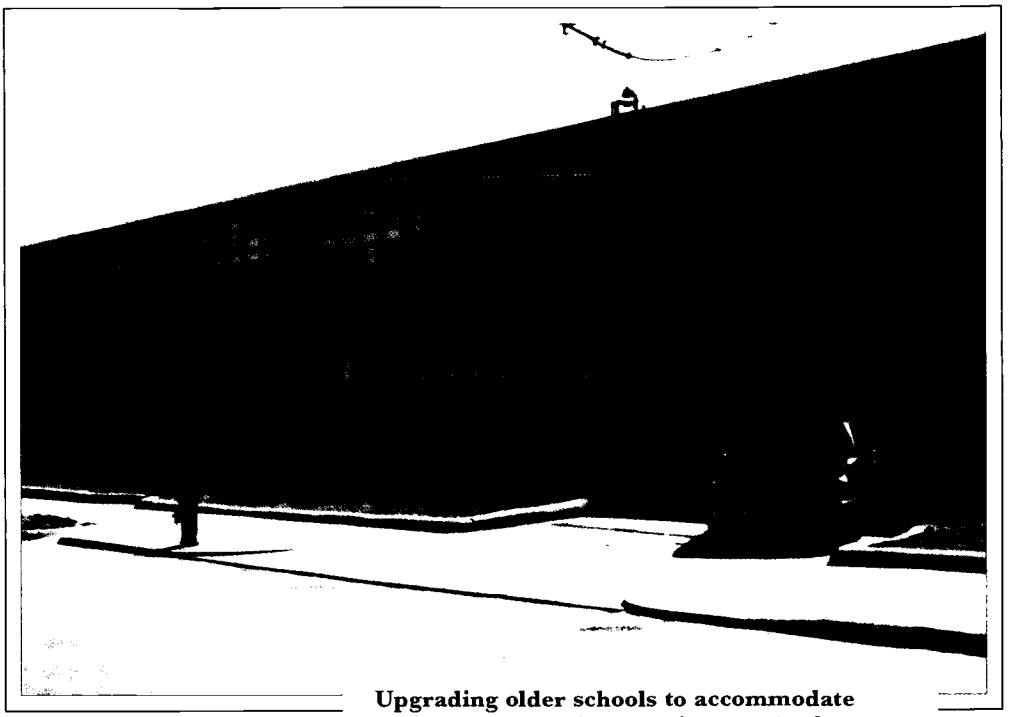
The GAO found most schools lacking "the key technologies or facilities required to

MOST SCHOOLS REPORT SUFFICIENT COMPUTERS AND TELEVISONS BUT LACK INFRASTRUCTURE TO FULLY USE TECHNOLOGY



Source: General Accounting Office, *School Facilities: America's Schools Not Designed or Equipped for 21st Century*, 1995, 12.

support learning into the 21st century." It goes on to conclude that, "although at least three-quarters of schools report having sufficient computers and televisions, they do not have the system or building infrastructure to use them."



Upgrading older schools to accommodate new technology often requires costly changes to building structures.

The fact is that renovating schools to support technology often requires changes to building structure, wiring and electrical capacity, air-conditioning and ventilation, as well as security. It is no simple matter. Upgrades in electrical service commonly require new circuit breaker boxes and raceways for computer cables and telephone lines. Recent construction practices provide channels for wiring, but solid walls often demand demolition.

The GAO estimates that nearly $2.4 billion will be required simply to comply with new regulations on asbestos management, a major factor in rewiring schools. "Although designing a new building with this infrastructure included is relatively easy and inexpensive, installing it in existing school buildings can be expensive and disruptive," the GAO notes. The question before school officials in many districts is whether or not engaging in such renovations is a waste of precious construction funds given the number of buildings that are nearing the ends of their structural lifespans.

Few Able to Sustain

The data from the GAO studies demonstrates that communities and education personnel are beleaguered by school conditions, by federal mandates, and by budget priorities. Many school districts operate from crisis to crisis in an atmosphere of growing community cynicism.

But the GAO also cites cases where schools built in the same jurisdictions at the same time are now in surprisingly disparate condition. Like sister ships launched in the same year, some weathered well while others weathered badly. Sound construction, timely maintenance and good luck have sustained some schools in some very poor districts. But these schools are in the minority. The cruel impact of wavering support for refitting and rebuilding America's schools remains massively evident.

PROBE Roundtable

PROBE brings together experts on learning and school facilities to discuss what we know about school facilities and what we still need to know to help policymakers and community leaders manage facilities needs in their schools.

Around the Table

Brian Curry is a senior policy analyst at the Tallahassee, Florida, office of South-Eastern Regional Vision for Education. He is a member of the association's policy council.

Larry Friedman is currently on leave from his position as associate director of the Regional Policy Information Center at North Central Regional Educational Laboratory, Oak Brook, Illinois.

Soleil Gregg is a policy analyst at the Appalachia Educational Laboratory in Charleston, West Virginia. She is a member of the association's policy council.

Eleanor Johnson is assistant director of Education and Employment Issues at the United States General Accounting Office, Washington, D.C.

David Roccosalva is director of Professional Practice at The American Institute of Architects in Washington, D.C.

Roger Scott is a senior staff member at the San Diego office of WestEd.

Dena G. Stoner is president of the National Education Knowledge Industry Association in Washington, D.C. She is a member of the association's policy council.

D. Stoner: School facilities is an issue that, frankly, America did not want to hear about. There is a feeling that while the federal role might concern education activities that go on in these facilities, the facilities themselves are outside the federal purview. The GAO has substantially begun to affect that perception. You say in your publications, Eleanor, that nearly one-third of our schools need major repairs. Of those, do you know how many

schools need to be completely rebuilt, where just repair doesn't do it?

E. Johnson: The precise answer is no. There are a lot of local construction and cost issues associated with this. In one place it may be economical to repair a given condition but in another it may make more sense to tear the building down and rebuild. What we did do, though, was provide a framework for comparing either a given state or whatever local unit someone might be interested in with the national picture. I have consistently suggested that researchers use the survey we developed as the basis for a local survey, customizing it for whatever is of interest locally.

On Common Standards

D. Roccosalva: One interesting question is whether there is a minimum standard by which to determine if a school should be rehabbed or completely rebuilt.

E. Johnson: It's one thing if you can send a team of architects out to every single school, but it's quite another to ask people who may not be facilities experts what things need preventive maintenance and/or repair. Codes vary. What "fails to meet code" differs from school district to school district and even within districts. One rural superintendent we talked with had five schools in her district, and every school was in a different town with its own fire department and fire code. Because of this, every building in her district had to meet a different standard.

D. Roccosalva: Currently there are three or four major building codes that have been adopted throughout the United States. On top of that there are local codes. One of the things that AIA is working towards is a uniform building code that would, to some extent, standardize local codes. We're also looking at performance standards. For example, for fire egress, a performance standard might require you to be able to get x number of people out of a building within a certain time. How you do it is up to you. There are no regs saying your stairway has to be 4 feet wide or 10 feet wide or that you need 6 ramps or 2 elevators.

On Flexible Space

B. Curry: We have to keep in mind that the emphasis in education is on local flexibility. Communities are looking at school choice and charter schools and putting portable units wherever they can find the space for them. There has to be flexibility in facilities if we're going to carry through reform. The real question is what sort of functions do we want to put into our buildings. Swimming pools, football stadiums, theaters, and art rooms are all curricular issues.

Dena G. Stoner

R. Scott: You need to have at least the basic facilities that will help you achieve the kind of performance you want. Say educators were interested in offering more students cooperative learning groups, like was the case in a very old, prestigious school in Massachusetts last year. The school had an extremely large room with row upon row of desks that were nailed down to the floor. Educators wanted to rip up those desks and construct partitions. The townspeople were aghast at the idea of destroying the ambiance and heritage of the room. They finally had a city referendum and voted it down.

S. Gregg: New school buildings may not always be necessary. You don't need a building for virtual school rooms. Also, every city and community has buildings that aren't used all the time. Why not have classrooms and

Soleil Gregg

smaller groupings of students actually out in the community instead of in central buildings? We need to figure out what sort of space requirements we have as a community, and include school needs in that assessment.

B. Curry: At least the facility needs to be used differently. I know of a school in Miami that has 12 periods in a day. It's open from 7:00 A.M. until 10:00 P.M. to accommodate kids who work. There are schools at the Miami International Airport. There are schools in banks. The notion of the facility as we know it is going away. We're going to see a whole array of places that we will call "school."

E. Johnson: I'd just like to jump in here with a very unscientific anecdote. My daughter's high school is about to go through a major renovation and rebuilding project. They have to move the kids. There are some fairly new business buildings vacant right across the street from the high school but there have been tremendous problems in using them because of fire and other local codes having to do with where schooling takes place.

S. Gregg: So barriers to more efficient uses of available space become a real policy research question.

L. Friedman: But there's a reason why we wanted kids together, too. We lose something when we start this radical distribution of educational functions across lots of spaces. Some songs sound better sung by a chorus. Maybe a way to do it would be on a year-round schedule. That way at least kids could spend four months in a place that lets them build a sense of community with their peers. The other times they could be out in the community seeing how things work there. Otherwise, we just play into a pervasive over-individualization of society that I regard as particularly problematic for keeping society and education together.

And another thing, schools are a community anchor. In rural communities, especially, if you lose your high school, you lose a town, you lose a community. So schools have social functions that are absolutely critical in a lot of ways, just as they have pedagogical functions.

B. Curry: I agree that a sense of community and having a place where people come together is important. Adult education, schools being open until late at night, and spaces for community activities all provide that. Nor am I suggesting we parcel out students and not let them come together. There are times when they clearly should be together as a community. What's the only education institution that's not open year round? The public schools. But all learning isn't going to take place in a school building. It's going to occur off-campus, too.

On Research

R. Scott: When we started our research on school facilities and reform four years ago, we were concerned that some reforms would be very difficult to implement given our present facilities. We identified six areas of reform: curriculum and instructional methods, use of technology, assessment, the management of the school, the services, such as social services that the school would offer, and scheduling. Given these, we asked what a school would look like if a particular reform was going on. What would kids be doing? What would teachers be doing? Administrators and other people? And if they were doing those things, what kind of facilities would help them? What kind of facilities would get in the way of their doing those things? In the end, we had a core of facility elements that make implementing reform possible.

L. Friedman: Every new school that is built or significantly renovated provides an opportunity to ask similar questions. If the topic is cooperative learning, we ought to ask: Where do they put the kids? In new buildings, in particular, we should ask why they decided to design the building the way they did. Did it work? What would they change after being in the building six months. Those kinds of questions never get researched and they should.

Larry Friedman

E. Johnson: I would love to see three to five typologies of adequate schools be developed. Different communities have different ideas about what adequate is, and this translates into very different buildings. Even at the lower end, there are some no-frills schools that offer a perfectly good education. We shouldn't constantly hold up the super schools. It's far better to show the range.

We also need to produce studies on useful models and best practices so that people who

actually deal with school facilities — be they administrators or architects or community leaders — can get good ideas and information. My experience in the field of education is that most policy is not research based. It may be research defended, but the decisions are made according to criteria other than hard research.

R. Scott: But facilities are just one of the tools that help implement education programs. That's what makes research in the area difficult. There are a lot of other variables that are at least as important as facilities.

D. Stoner: Kansas City is a premier example of a district with an enormous building program. The first reports said that the effort has had little effect and just slammed the school district. Mid-continent Regional Educational Laboratory began looking at achievement, and, not surprisingly, they saw no difference in the aggregated achievement data. You have to remember that the kids in high school spent their K-8 years in terrible schools. It was unrealistic to expect that when they walked into a nice school at the ninth grade their achievement would automatically leap ahead. But when the researchers looked at achievement among the youngest children — those who entered renovated schools in kindergarten, first, second, and third grades — they saw remarkable new things happening. First of all, teachers in those schools had changed their instructional techniques because the buildings could accommodate them. Reading scores were beginning to go up, as were some mathematics scores. It can take time for the impact that good facilities have on learning to show up on achievement tests but better teaching should become apparent almost immediately.

R. Scott: That's one of the few kinds of research designs that might show the effects of facilities, especially if the research was conducted in a large school district that renovated a number of elementary schools every year. You could look at the before and after of those schools — where you would hope that the school population, including the teachers, remained fairly constant over that time — and pick up those differences in achievement.

David Roccosalva

S. Gregg: There are data that repeat themselves many times over. By upgrading facilities you can count on a certain percentage point increase on test scores, reading, math, the whole works. There are definite correlations if you bring a facility up from poor to adequate, or from adequate to good.

L. Friedman: It's researchable, but first experts in evaluation design need to carefully think it through. This is exactly the sort of stuff that peo-

ple love to jump on because we really don't know very much about making correlations between facilities and student achievement.

On Community

D. Stoner: A lot of people don't think design is worth any money. They don't want to pay for it. Choosing architects who understand the relationship between environment and learning is something that a community must want to do. Architects can't get into the mix unless they're asked to be there.

D. Roccosalva: And that brings us to how you get a community more involved. What are the benefits of a school that, while maybe not open 24 hours, is much more of a community hub than most schools today? Can you get the graying population to vote on a bond issue if it contains something for them?

S. Gregg: We do have anecdotal evidence that when the community — parents, teachers, students — gets involved in the planning process, bonds get passed that couldn't get passed before.

D. Stoner: Community resources are only so deep around dialogue issues, too. The problem is not just money. People have only so much time, so engaging them efficiently in community issues becomes important. We can get so enthralled with dialogue that we forget that people are very busy.

D. Roccosalva: That's actually one place where the virtual world can come into play. It lets you have a good portion of the discussion ahead of time so that when people do come together in real time, it's worth their while.

D. Stoner: It would be very interesting to experiment with dialogue about space using electronic technology, particularly if an architect were to put actual designs on line to show how people's ideas would look if they were implemented.

L. Friedman: People could just sit down and ask to see five examples of what they want to do in a northern climate, for instance.

Eleanor Johnson

E. Johnson: There's a need to build a constituency for school facilities and this might be a way to do it. That's where I see models of very new and exciting ways to use architecture and education coming in, or even conversely, horror stories.

On Financing Facilities

B. Curry: As we started to look at facilities in Florida, we realized that facilities were just

Roger Scott

one part of a bigger issue. The real challenges we're up against are growing student enrollments, overcrowding, deferred maintenance, and limited resources. Florida passed K-3 class size legislation last year. One of the effects is that Dade County alone needs 70 new schools. Now, growth, of course, is a big part of that, too.

R. Scott: California also passed class size legislation. Previously, most of our school facilities problems were caused by the lack of money; now they're due to an influx of money. Schools are getting money for reducing class size but nobody quite thought through the impact of the legislation on school facilities.

D. Roccosalva: Juvenile detention centers are growing in leaps and bounds in the same areas that schools are growing in leaps and bounds. Utah, Nevada, the whole Southwest is just burgeoning with new juvenile detention facilities. It's very interesting because your tax dollars are going to go to one or the other. You have to decide where you want to put them.

B. Curry: The relationship between business and the public sector is another major policy question. When developers build neighborhoods, they install sidewalks and sewers and other infrastructure, or at least they pay for part of them. What about asking them to do the same for schools?

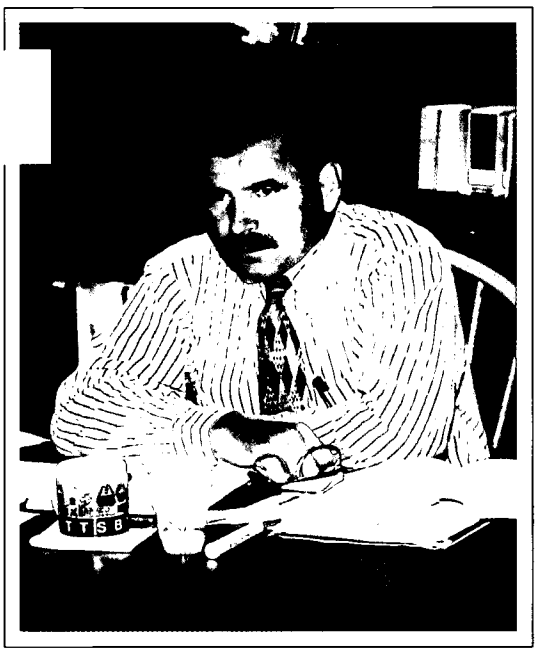
E. Johnson: There are profoundly different philosophies and policy positions about who is responsible for funding school facilities. Often, they're related to how much information a state has.

D. Stoner: That's a pretty important statement you just made there, Eleanor, about funding being connected to information. How is that?

E. Johnson: Some states really feel that paying for school construction is a local responsibility. Other states see it as a state responsibility. Because facilities cost big bucks and because poor schools tend to be located in resource-poor places, this gets right into issues of equity. No matter what the local political climate may be, the courts may tell school districts that they have to do something else.

As for collecting information, there's a lot of justified feeling that there's no reason to spend a lot of money collecting information that no one is going to use. Many states have a very pragmatic information system. Instead of maintaining evaluations on the status of all their buildings, they collect just what they need from the school district when a project is coming up for state funding.

S. Gregg: One thing we haven't covered is finance structures and options. Can or should local taxpayers pay for facilities? Older people with limited incomes and no children in school may not necessarily want to pay for schools. There may be a place, if the public were receptive, for some sort of tax schedule contribution strictly for facilities. I know that the federal role



Brian Curry

is an issue, but maybe people would be willing to have some sort of federal involvement in this small area. That squares with equity issues, too.

L. Friedman: Another thing that fascinates me is using space cost-effectively. If you have a building that's open longer or for more purposes, in theory, you get more for your money. Is that really the case? Or if you're way north, is that only the case during the summer months when you don't have astronomical heating bills? There are lots of issues around cost-effectiveness here. I would like to see a big database built so you don't have to keep calling around to try and find somebody who has done something before you.

D. Stoner: There is considerable argument that one of the ways to think about budgets at the federal level is to examine assets in a more business-like way and depreciate them. We may not get a real concentrated look at facilities until we acknowledge them as assets in state and local budgets.

L. Friedman: The data are there. Capital expenditures account for 14 percent of education dollars a year. But do you want to tell people that 14 percent of their education dollars are going toward facilities? You might be setting yourself up. If we didn't have the building, that's 14 percent more dollars to educate our kids. You may hear some really compelling arguments for not building more schools.

S. Gregg: According to what I've seen, most maintenance budgets run about 3 to 4 percent in rural areas and as little as 2 percent in urban areas. Back in 1950, they ran about 11 percent and they've been declining ever since. If you look at where that 14 percent is going, you'll see that it's not going to schools that are falling apart but to new buildings with a lot of debt concentrated in very small growth areas around major cities.

L. Friedman: That's why we need to get data on within-district and within-state variability. Then we can examine some of the equities in really powerful ways. Right now it looks like there's not that much variability, but we know that's not true.

Other Environmental Concerns

S. Gregg: The effects of the building on children's mood, behavior, aggression, and sense of security are well known. Homeless children pose a real concern in schools. I've read about

playgrounds that have little spaces or play houses where kids can retreat to the security of a "home."

R. Scott: And teachers, too, have space needs. Phone lines are a good example. Here's an 1880s technology, and teachers still can't find a quiet place with a phone to call parents, let alone hook up to the Internet. Or if you ask if a school has space for all the staff to get together for a workshop or a staff development activity, invariably the answer is yes. But then if you probe, you find out that the space is in the library or the cafetorium, or someplace else that's often not suitable. Have you ever seen teachers trying to squeeze into fifth-graders' desks? That's the kind of thing that goes on. Very few schools have dedicated space for teachers' activities.

D. Stoner: And we know the relationship of graffiti and a positive learning environment. The American public understands that when there is graffiti all over a school's walls, that school is out of control. The research shows that communities do two things when confronted with defaced schools and chaotic learning environments: First, they go in and wash the walls and pick up the trash. Then they begin to focus on discipline. And they do those two things intrinsically. They understand there's a relationship between facilities and behavior. Well-maintained facilities communicate a respect for the people and activities that are housed in them.

R. Scott: Baltimore's Patterson High School had, at one time, over 2,000 kids completely out of control. After the facility was scaled down and separate academies placed within it, giving each academy a separate entrance, the school made a dramatic one-year turnaround. Now it's calm and peaceful. That doesn't directly relate to learning, but it makes learning possible where it was impossible before.

D. Stoner: Something that I find over and over is that educators are not the ones who make decisions about new facilities. If there is one point I'd like to put on the table it is that the removal of school facility decisions from people who are actually going to be working in those facilities needs to be called to the attention of communities. It has to do with respect for the professional knowledge of the educator, among other things. Too many people think that the professional educator doesn't have anything to bring to the table, and so teachers and administrators aren't there at the beginning or even at the approval stage. I wonder what schools would look like if educators were intimately involved in school design right from the beginning.

Thank you very much. The purpose of this is not so much to come to a conclusion but to find areas where we need to probe, and we found a lot of them.

Design and Consensus

By Julie Miller

An innovative planning process is helping communities realize the "stuff" of their education fantasies.

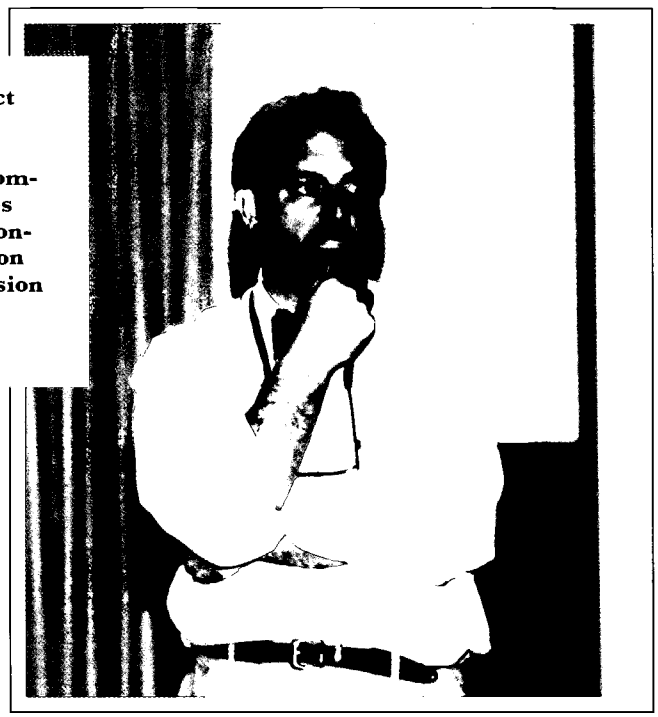
The four-building complex, built of brick and local Tishomingo stone, set with its athletic fields and tennis courts on 100 acres of land, is a state-of-the-art school. But it is also more than a school. It is a community theater, a child care facility, a conference center, and the home of a regional professional development initiative.

This "stuff" of educators' fantasies stands in the pine woods near Iuka, in northern Mississippi, because governmental and economic interests converged to make it possible, and because an innovative planning process extracted from its rural community a shared vision of their ideal educational environment.

Thousands of miles west, in Stockton, California, the same collaborative planning process yielded plans for a futuristic campus where students could study science at an environmental resource building, plug into a technology center, work out in a fitness facility, or follow agricultural pursuits on the school farm. It is designed to be a totally interactive learning environment; even the campus' infrastructure is to be a teaching tool, incorporating such technology as solar panels and a cooling tower instead of conventional air-conditioning. A satellite learning center was also designed for a piece of land miles away in the marshes of the immense riverine estuary that dominates this region of California. While this sweeping communal dream is unlikely to ever be fully realized, parts of it will eventually be fleshed out in wood and glass. Meanwhile, it has given the Lincoln Unified School District a goal to shoot for.

Still a third product of collaborative planning is on the drawing board in Calhoun County, West Virginia, where ground is being broken this fall for a junior-senior high school that will showcase the latest in educational technology and the work of local artisans.

What these projects have in common is Steven Bingler, a New Orleans architect who specializes in helping school districts come to a consensus on their vision for an innovative



Architect Steven Bingler helps communities reach consensus on their vision of the future.

facility, or sometimes, even a broader consensus on their educational future.

Communities in Dialogue

That process was on view in Lincoln, California, in September, when the West Placer Unified School District's planning committee spent an entire day discussing what they want from their new school facilities. The area is expecting substantial growth in coming years as development reaches north from Sacramento; one developer is planning to build 10,000 new houses in a massive commercial-residential project called Twelve Bridges.

"The purpose of today," remarked Superintendent Roger Yohe, "is to get all your ideas on the table, to talk about how to take the information you've gathered and turn it into a plan."

Participants in the initiative, dubbed Project Build, had already spent months compiling data on the area's resources and needs. While about 60 adults listened to presentations by local and county officials, the students participating in the process held their own deliberations, preparing lists and drawings to illustrate their ideas for the new school. After lunch, they presented some of their ideas to the adults.

Involving children is a key part of the planning process. "Kids have the best ideas because they don't have any preconceptions," Bingler said.

Calhoun County students, for example, came up with the notion of using the new school's technological capability to market artisans' products on the Internet as a student business. In Stockton, students were the ones who insisted that the planned school have an environmental focus and a farm setting, and a student thought up the idea of contracting with a private firm to build a fitness center that could be used by the school district in the daytime and as a for-profit health club after hours.

After the children presented their work, participants broke up into groups, identifying resources, obstacles, and ideas in four areas: physical resources, socioeconomic climate, governance, and "learning resources." Each group drew up a list of ideas on large easel pads. For example, the governance group suggested a permanent advisory panel for the project, the economics group discussed possible partnerships with local businesses, and the physical resources group talked about using local clay deposits in a ceramics class.

Each of the participants "voted" on the ideas by placing small circular stickers next to

the ones they favored. Bingler's group was to return with a prioritized list of ideas and activities based on these votes. Some of the most popular ideas were creating a system of bike paths and establishing a science academy in conjunction with nearby Sierra College.

An Influential Failure

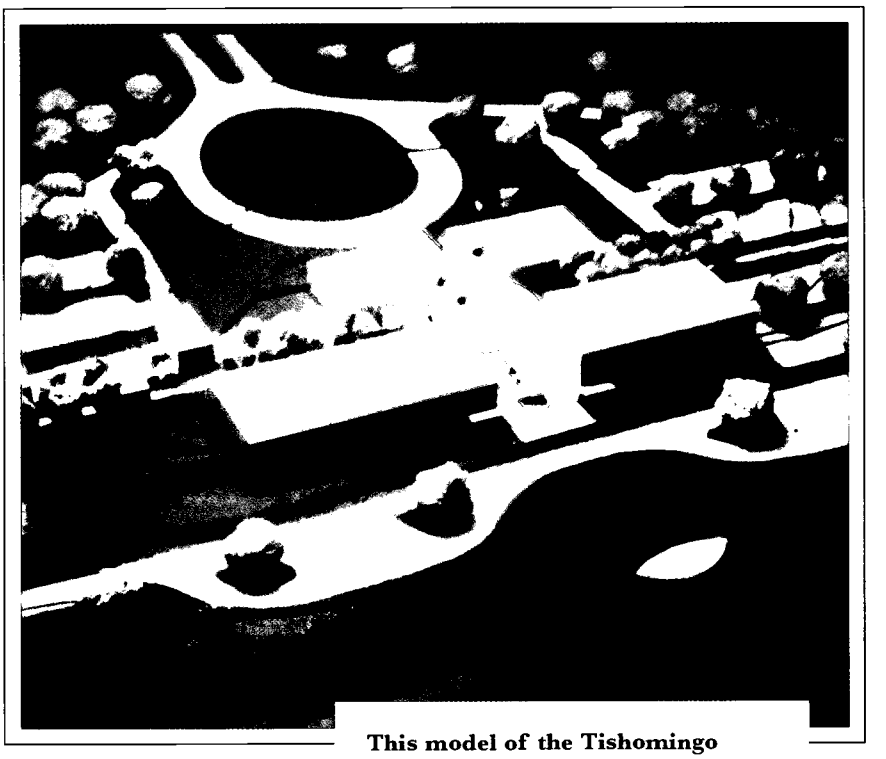
Steven Bingler's involvement in school planning began inauspiciously, with a project that imploded. Someone familiar with his work on such innovative buildings as the New Orleans aquarium asked him to design a school in northeastern Louisiana.

"If I was going to do it, I was going to find out what was happening in educational architecture and design a school that was on the cutting edge," Bingler said.

So he began researching school design and attending conferences, where he found to his dismay that "all the sessions seemed to be about leaky roofs." The focus, he said, "was not on education but on the cheapest way we can build schools." Bingler eventually organized his own symposium on learning environments.

But the project that launched all this research became bogged down in local politics and a legal challenge by a local architect who believed he should have gotten the contract. Bingler said, "In the end, the local architect designed a traditional school."

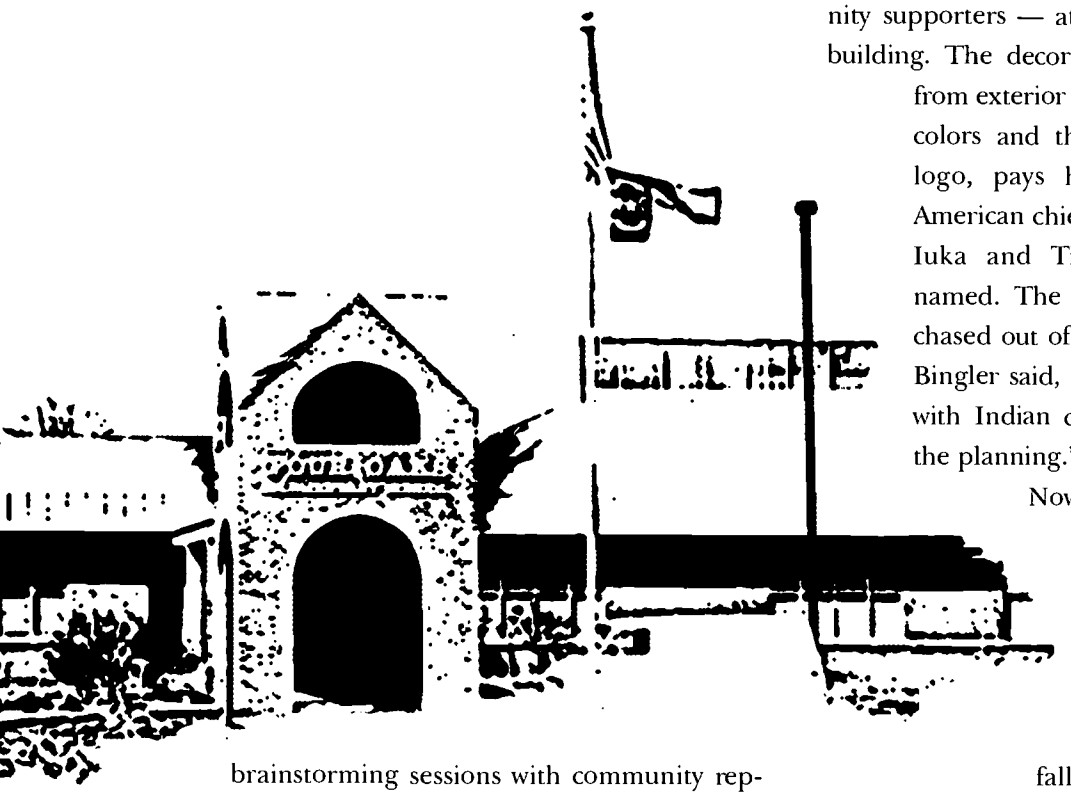
But by this time Bingler's design had been published and was attracting attention. And he had developed an interest in schools. Meanwhile, in neighboring Mississippi, state officials were preparing to spend $25 million to improve community infrastructure in the northeastern region of the state. They invited him to collaborate with a local architect on a project that became Tishomingo County High School.



This model of the Tishomingo County education complex was built as a state-of-the-art school and community center.

A Community Facility

His Louisiana experience taught Bingler the importance of community support. The planning process that is his trademark grew out of



brainstorming sessions with community representatives in Tishomingo County. Students wanted a more open environment. Parents wanted more activities for their children. The community had no theater and no place to hold a large meeting. There were no child care or exercise facilities.

The school that emerged from these community planning sessions includes four buildings grouped around a central plaza. The cafeteria, which doubles as a meeting place, resembles a hunting lodge and has a big stone fireplace. The auditorium serves as a community theater, hosting events that range from beauty pageants to ballet. A child care center serves as a training ground for students interested in careers that involve working with children. The gymnasium is also a community fitness facility.

The layers of brick and stone in the exterior mimic local soil strata, according to Bob Haggard, the school's principal. Handprints and other designs cast in concrete by community supporters — at $20 a pop — ring the building. The decor of the entire complex, from exterior stone patterns to interior colors and the school's Indian head logo, pays homage to the Native American chiefs for whom the town of Iuka and Tishomingo County are named. The Indians were essentially chased out of this part of the country, Bingler said, but "a strong fascination with Indian culture came out during the planning."

Now 70 percent of Bingler's work is school facilities, "and most of the rest is museums," he said, 'including the Henry Ford Museum that is scheduled to open this fall in Dearborn, Michigan.

Breadth and Depth

The idea of consulting with community representatives on school design is not unique, and some of the innovations in the school plans Bingler has worked on are being used by other architects as well. What is unusual about Bingler's planning process is the scope of the discussion, the participation of such a broad range of people, and the level of detail the community members become involved in.

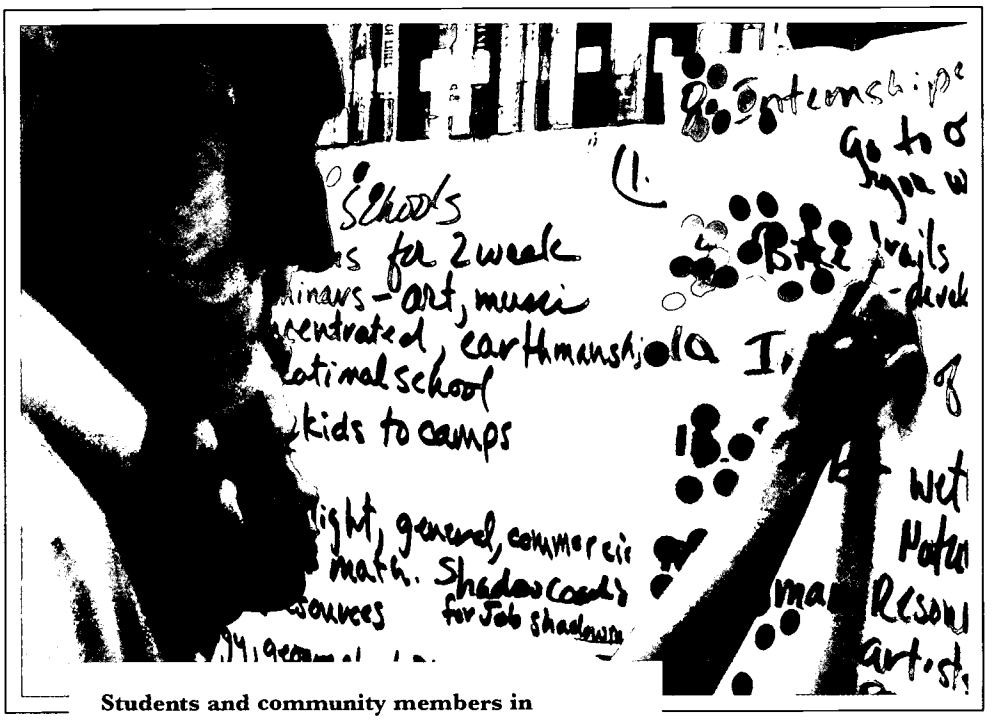
"Most school architects do a version of what Steven Bingler does," said William Stevenson, an Arizona architect who is the chairman of the Architectural Institute of America's education committee. "In most areas of the country, you have to pass a referendum to fund a school project and you have to convince the community there's a need."

"You need to come up with designs around what communities say are important

issues for them, build schools around what clients say they want to teach," he added.

"But I think Steven takes it further than most do," Stevenson continued. "He gets into more dialogue than most of our school board clients feel would be appropriate for their community. He creates designs that are beyond what most people are doing."

"The breadth is unusual; the time that was invested and the involvement of certain people is definitely unusual," said Gaylaird Christopher, a well-known school architect based in California who worked with Bingler on the Lincoln Unified project.



Students and community members in Lincoln, California, prioritize what they want from their new school facilities.

At this point, the products of the process are mostly blueprints and scale models. The only school building actually erected as a result of Bingler's community brainstorming is Iuka's Tishomingo County High School.

More than Blueprints

It is an undeniably attractive and functional school, with state-of-the-art science laboratories, classrooms with movable walls, and every other accouterment imaginable. It is designed to deaden sound. The building is so quiet, "everybody tells me, 'It's like you don't have any students," Principal Haggard said.

Teachers say they are delighted to be working there, and residents say they have even gotten over the loss of three small high schools that disappeared when three districts merged to create the Tishomingo County district.

"In small communities, the school is their identity, and when the school is gone it's like a death in the family," said Willa Riley, a resident who worked on the planning team.

But "the results even exceeded what we had hoped for," she said. "In larger cities, they have facilities we don't have in a small area. We wanted the school to be an integral part of our community. It brought us together as a community."

In Calhoun County, Assistant Superintendent Donald Pitts credits the extensive planning process with generating the community support needed to pass a bond issue that helped pay for some elements of the school design not covered by state grants. It

passed last year; after voters had shot down three earlier attempts.

"It was the people involved in the planning process who pushed this thing so it passed," Pitts said. "There was some talk when it got out that the cost was $13 million and that we were building a Taj Mahal. The people involved in this process got to know what it takes to put together a school building."

Broaching Educational Change

In Stockton, the planning process gave the school district an educational as well as physical plan. "It was more than planning a school, it was broaching systemic change in the institution," said Arnie Glassberg, who met Bingler at a conference and brought him into the Lincoln Unified project when he was an assistant superintendent there.

"Ultimately, we really saw a whole school district with different campuses, each of which had a different orientation toward life," said Glassberg, now an assistant superintendent in the Hayward Unified School District near San Francisco.

"The circumstances were unusual in that you had a district achieving very well in a conventional education system that was ready to look at things anew, an administration that was ready to do something special," Christopher said.

A Time-Consuming Model

Of course, even if the results produced by Bingler's planning process are as magical as his supporters say they are, they would not be much help to the school district faced with 10,000 extra students who need desks to sit behind and a building to do it in now. The brainstorming process can take a year or more.

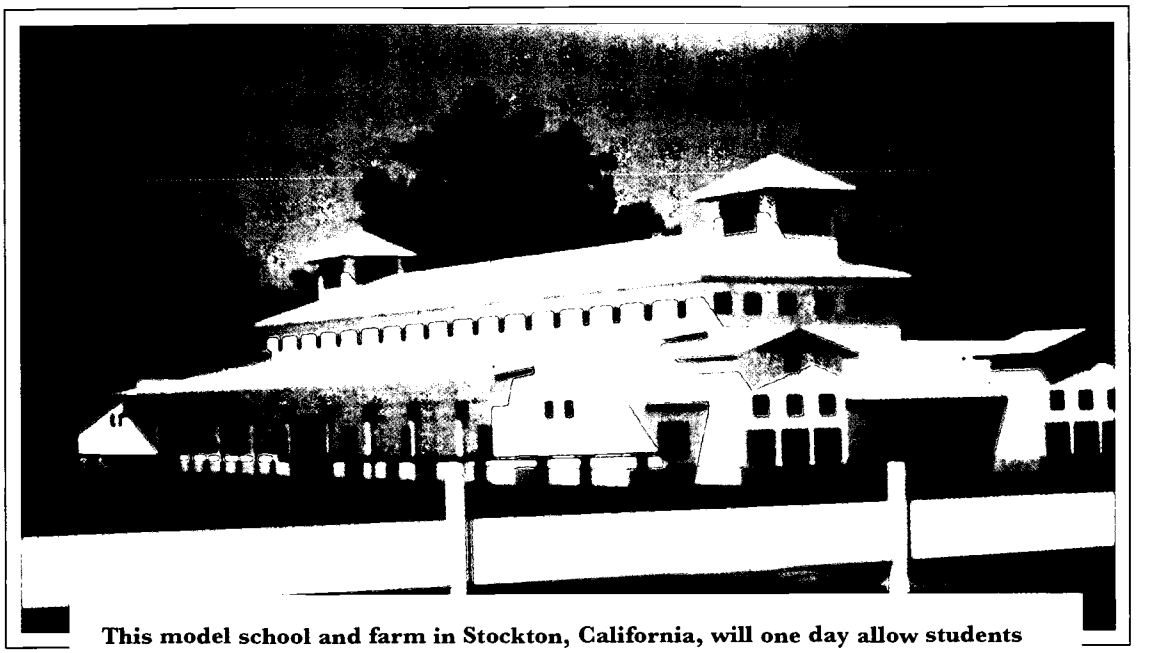
One problem Bingler himself has noted is that it is difficult to sustain a long-term project in the education field, where the players change constantly. School board members can change with each election, and administrators move on to other things. The superintendents who oversaw planning in Iuka and Calhoun County left before the schools were built, for example. And of the team of administrators that worked on the Lincoln plan, only one remains with the district.

A more daunting obstacle is that only districts with plenty of fuel in the fiscal tank need apply. Bingler's fee runs to six figures. More importantly, the innovative designs that result from months of dreaming-by-committee are not bargain-basement models.

The process is attractive to districts in particular circumstances. Some, like Lincoln and West Placer, are planning for future development that is expected but not yet packing existing schools with children. They can count on revenue from new per-pupil aid and from contributions required of the developers.

"We had a unique opportunity to think in advance about an ideal learning environment. We had the time, the manpower, and the money," said Joanne Neft of Project Build. "We were looking for someone interested in creative thinking."

And what the community developed was a plan that, over time, will save them money. Jim Bush, Director of Facility Planning in the Placer County Office of Education estimates that the community could save as much as $18 million over the cost of constructing a standard school building by implementing the rotating schedule the community designed for its education program.



This model school and farm in Stockton, California, will one day allow students to follow agricultural pursuits.

Other Bingler clients, like Tishomingo County, Calhoun County, and nearby Putnam County, West Virginia, received state grants. Tishomingo County benefited from a manufacturing facility that ultimately was never built.

In the wake of the Challenger disaster, the National Aeronautics and Space Administration (NASA) was interested in building a facility in northeastern Mississippi for the development and manufacture of a new kind of rocket booster. Improved schools would, state and federal officials believed, attract professionals to work at the plant and educate the region's young people for careers there as well. New schools were built in nearby Corinth and Tupelo. But the flagship of the effort was in Iuka, which is also the site of the Tri-State Education Initiative, a consortium of 29 districts at the intersection of Mississippi, Alabama, and Tennessee.

The initiative holds computer classes for students, and its facilities can be used for such purposes as writing workshops. But the mainstay of its mission is teacher training. Much of the initiative's work focuses on teaching educators to use technology, although they have also held training sessions on everything from stress management to alternative assessment.

"We like to show teachers where the future is," Arnold said. "One principal once told me 'We're five years ahead of where we'd be otherwise.'"

"Bingler came with the state money, which was also contingent on consolidating school districts" into the new Tishomingo County district, said John Arnold, the executive director of the Tri-State Initiative. "They drew a 50-mile radius around Yellow Creek (the site of the planned plant) and said 'We need to improve the schools here.'"

In 1990, after some $2 billion had been spent, Congress voted to cancel the rocket plant, arguing that improvements in the current design had improved its safety enough so that a new one was not needed. Despite this,

from 1992 through 1994, NASA supplied the initiative's entire $200,000 annual budget. In 1995 and 1996, member districts picked up half the tab. Beginning in March 1997, the project will be on its own, and Arnold thinks it can stay afloat with more member funding and private donations.

"But the people there can still drive on the highways they built, and the educational system benefited enormously," said Bob Ferguson, who was the superintendent of schools in Tishomingo County when the school was built. He is now superintendent of the Picayune school district near the Gulf Coast.

It is more difficult to show tangible results in student achievement. One thing that has apparently improved is the percentage of graduates going on to higher education; it has risen from 21 percent in 1991 to 30 percent in 1995. The district is one of 19 to reach a high level of accreditation under state standards, a status based on both programs and achievement. Its test scores rank it in the top 20 or 25 among the state's 149 districts. But the northeastern part of the state has historically had good schools compared with more impoverished regions, according to observers. It has a very low minority population, and while the county's average household income is under $13,000, that is actually not low by Mississippi standards.

Dreams and Reality

The community-planning process can also run the risk of raising people's expectations a little too high. Communities need to understand from the outset that it is unlikely their dreams will all come true at once.

The obvious example is Lincoln Unified. If the entire campus were constructed to plan, said Sarah Hart, who succeeded Glassberg," it would cost at least $60 million. The district never intended to build the whole campus at the same time, but it was expecting more revenue than it will receive, as the developer's home sales were not up to projections. The district actually has $8 million for construction, and officials are planning to make a modest beginning by building the environmental resource center and one of the 10 "learning centers" in the plan. It looks like the fitness center will also eventually be built.

More money may be found someday for additional learning centers, and the district would really like to make the $5 million technology center a reality as well.

Tishomingo County and Calhoun County have also had to scale back their dreams for the time being. The Iuka school has abandoned the idea of bringing in an old train to turn into a historical exhibit. And the central plaza, which was to contain a sundial and solar observatory is just an expanse of grass for now.

In Calhoun County, such items as an indoor swimming pool and a grand entryway with a fireplace and balcony were dropped from the final plan, Pitts said, although local artwork will still be showcased at the school's entrance and the idea of students marketing artisans' work on the Internet "is not out the window."

However, even educators with some regrets about having to scale back dreams said the process was beneficial. Stewart, for example, notes that it will allow the West Placer community to get more for its money by designing facilities that meet multiple needs.

"The collaboration process was so powerful, it was the highlight of anything I've been involved in in education," Glassberg said.

Fit for Reform

by Anne C. Lewis

Translating research on school reform into workable plans for school facilities is a relatively new endeavor, but already some innovative architects and educators are leaving their mark.

In Vancouver, Washington, students entering the Discovery Middle School walk through a large open space used for community activities on the way to their "villages" in the school complex. There, they have access to their own technology centers for group or individual work. Othertimes, if they wish, they can climb up into a loft and read or work on projects that require "quiet time." The loft's expansive windows overlook the Northwest landscape. Remote cameras keep watch on the life and seasonal changes of the wetlands below the school, bringing them into classrooms for closer examination.

Does Discovery Middle School represent the future for its students, as did the country schools of a century or more ago? Or is it an aberration, a building that kids and architects love but that may not represent mainstream thinking about what a school should be a few years from now?

Throughout the history of public education in this country, school design has served as an overlay on the purposes of schooling. Early house-sized country schools were plain and functional, usually with only one or two rooms that also served as community centers or courtrooms. The most important design question was where to place windows in order to capture the sunlight onto blackboards for as much of the school day as possible. Bell towers not only called children to school, but also warned nearby residents of prairie fires.

The formidable, fortress-like school buildings of the nation's new cities, freed by electricity to hold hallways and stairwells, mirrored the order and sameness of the factories that churned the industrial revolution. Much later, low-cost and time-saving construction dominated the look of post-World War II school construction. If the school buildings constructed to accommodate the baby boom look so uniform, it is because school administrators used the same school plans, no matter the nature of the site. These

repeated the isolated-classroom design but spread it out under flat roofs and, in the big-is-better era, embraced the "shopping mall" programs intended to keep students in school by giving them an array of courses from which to choose.

But even back when most students still attended country schools, school reformers attempted to bring style into students' environments. Those Greek Revival cupolas, still atop some of the nation's oldest school buildings, did not get there by accident. Greek revival schoolhouses were a favorite of early school reformer Henry Barnard, who also was the first U.S. Commissioner of Education when Congress established the Office of Education in 1867. Barnard included Greek Revival in his handbook on school styles because, he said, "every schoolhouse should be a temple, consecrated in prayer to the physical, intellectual and moral culture of every child in the community."

The architectural plan books disappeared, but not the standard look. Worried that modern egg-crate environments stifled education reforms, the Ford Foundation funded the Educational Facilities Laboratory in the 1960s to help return creativity to school design. Architects' current appreciation of educational goals and school officials' attention to aesthetics can be attributed at least partially to the research, conferences, and publications of this laboratory.

The egg-crate plan was clearly gone among award winners at the school architecture exhibition during the 1996 annual conference of the American Association of School Administrators. Co-sponsored by the American Institute of Architects and the Council of Educational Facility Planners, International, the exhibition honored new buildings and renovations across a range of institutions, colleges as well as K-12. The Discovery Middle School, designed by the firm of Lein, Stanek & Wilson, received one of the two top awards. Displayed with it were such designs as a primary school built to look like a home with a wrap-around porch and picnic tables; a K-12 school for Native American children where students look out upon kiva-style courtyards; and the transformation of a 30-year-old traditional school campus into academic houses, each with its own discovery center for the latest media. (This design for the Westside, Nebraska, Community Schools received the other top award.)

School districts with clear visions of the educational program they want "have allowed school architecture to break out of the box," commented Jim Brady, director of Educational Facilities for the Austin office of Page, Southerland, Page, and chair of the school architectural jury. In fact, the design's expression of the school program was a primary criteria for the jury.

Architects Respond to Reform Trends

Architects respond "intuitively" to what school districts say they want in their designs for instruction, according to Jeffrey Lackney, who focused on K-12 environmental quality at the Center for Architecture and Urban Planning Research at the University of Wisconsin/Milwaukee. "They don't have time to link research to design."

To help architects become more reflective, Lackney and his colleague, Gary Moore, reviewed school reform literature and futuristic school planning reports from California and New York to develop a list of design patterns of school reform. Some items on their list are almost identical to the trends the

The Discovery Middle School in Vancouver, Washington, represents a new view of education.

AASA school architectural jury found among the exhibition entrants. Although certain ideas, such as community use of school buildings, recycle every generation, Lackney notes that research drives others. The research that supports smaller groupings for students is an example. Events, such as the rapid development of advanced technologies, can also power school architecture.

Drawing from these sources and others, six school reform trends seem to most influence current school architecture:

Small size. Scattered in the research literature are a number of studies that correlate better student achievement and behavior with smaller school settings, especially in urban schools. The cost efficiency of larger schools has exacted a price from students, who feel more estranged from the academic culture of a big school.

Architects respond: The idea of a "mainstreet" in schools is popular, says David Roccosalva, director of professional practice for the American Institute of Architects (AIA). These mainstreets are hallways that link "neighborhoods" or groupings of classes into houses, villages, pods, castles or other such nomenclature. The students in these neighborhoods interact with each other regularly, and with students from other neighborhoods in common spaces. Creating smaller units for students involves such mundane but important decisions as where to put banks of lockers, according to Brady. School designs that provided spaces for small groupings of students first began to appear in middle grades, Lackney says, and are now spreading down to elementary and up to high schools.

Active learning. Cooperative, project-based, and interdisciplinary learning are among the research-based instructional reforms that many schools are trying to achieve. All of these reforms require students to move about the classroom freely, and many require more than one work space and spaces where students can exhibit their work or put on performances.

Architects respond: "More and more designs are thinking of the effects of the application of knowledge rather than traditional ways of studying subjects," says Brady. A cluster design might provide access to water/science labs (placing group sinks together in a central location rather than providing one to each room to save money, Brady advises) and a performing arts gallery for projects, exhibits, and presentations. Multimedia are centralized. Carpeting may not be appropriate in a project-centered design. Moore and Lackney suggest that portfolio and other types of new assessments require appropriate work space, as well as areas for students to store and exhibit their work.

Collaboration among teachers. An interdisciplinary or even a team arrangement necessitates planning, discussion, and joint storage space for teachers. Also, trends in professional development are moving toward collaborative work among teachers rather than individualized programs or short-term workshops away from school.

Architects respond: Clusters of teachers' offices with joint space free up classrooms for instruction. For example, instead of using a science classroom during a planning period, a teacher moves to the staff offices center for planning, allowing another teacher to hold class in the room. The office complex contains copy and FAX equipment, teacher computer work stations, and telephones.

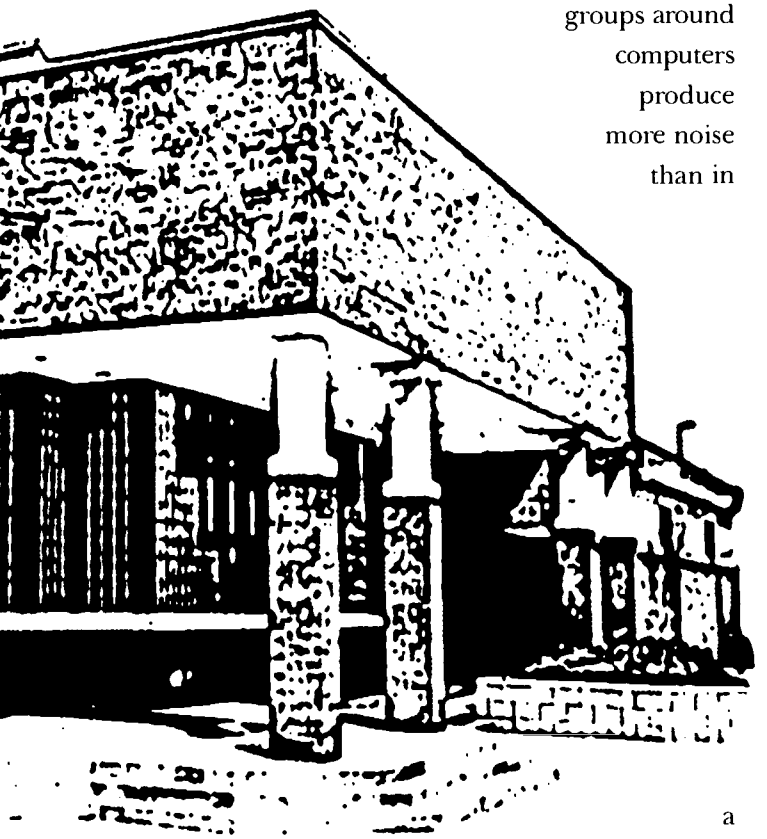
Continuing change. There will always be change in schools. As more effective programs and processes are researched and developed, and schools implement them, new needs for space arrangements will emerge. Lackney believes "we need to understand how to better use the space we have, such as renovating open areas so they provide multiple uses including more private study areas." His research also leads to caution about overdependence on a fixed notion of the use of space. Dividing space into small, uniform areas may seem a safe way to go, but "if it doesn't work, you're stuck with space that can only be used for storage areas." Large, open spaces have their limits, too.

Architects respond: The challenge, according to Brady, is to combine the best from traditional designs and full-flexibility ones, "allowing for a third model that is yet to be defined or developed." Modified open plans provide a balance in the use of space and take into consideration the different uses that might be required. One design idea is to take a cue from modern office buildings which anticipate moving walls as needs change. Furniture is easily portable.

Keeping up with technology. Communications infrastructures have become an integral part of today's schools. Five years ago, computer labs were a major design feature; today, computer installations line classroom walls, and in new designs, they have moved to the center of classrooms, taking into consideration new roles for teachers and students as they adjust to using laptops and integrating other media into all student work. More than regular classrooms are involved. For example, with access to massive sources of information in the classroom, the librarian's role changes from that of information provider to teacher, says Stephen Friedlaender, an expert on designs for technology at HMFH Architects of Boston. "The library becomes a teaching area, not a depository of books." The most popular technology among teachers, he has found, is not at the fancy end, but is the tele-

phone. "In spite of all the impressive banks of computers, it is a telephone with a red light signaling a voice mail message from a parent instead of a note from the office or a ring in the classroom that delights teachers," he says.

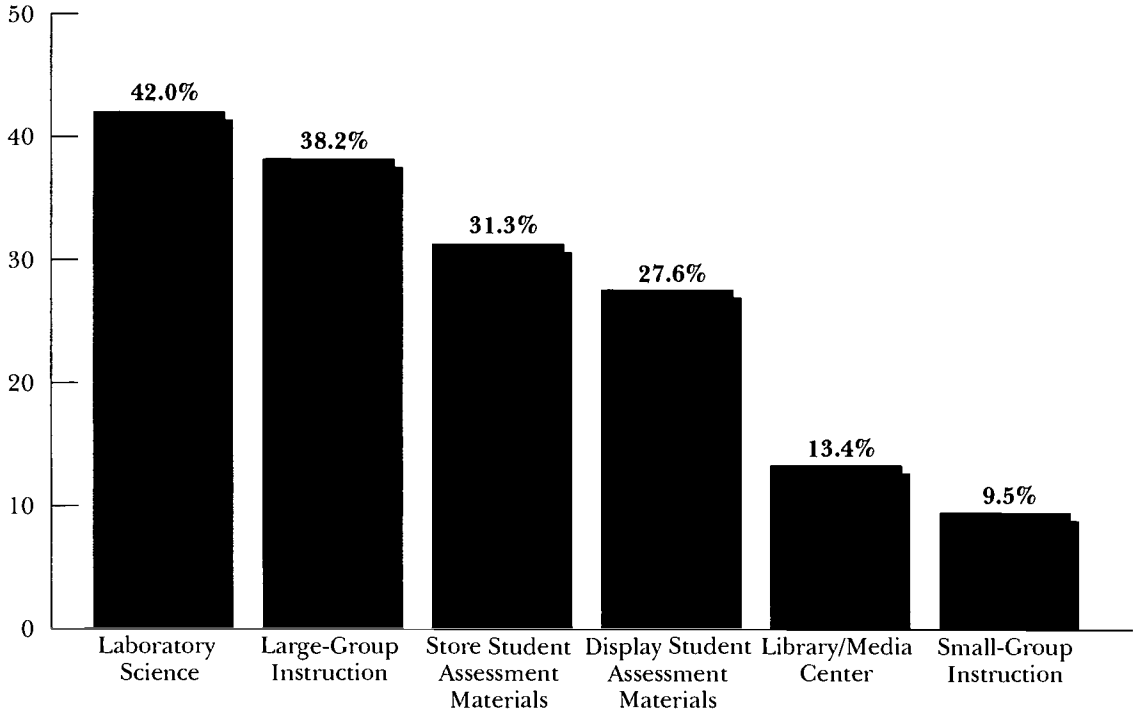
Architects respond: Technology is developing so fast that flexibility is the overarching concern. Fiber optic cable, even if not initially connected, allows for considerable expansion in the future, although the use of radio bands for telecommunications should be considered in planning also. Windows and artificial lighting need to be designed to reduce glare. Children working in groups around computers produce more noise than in a traditional teaching sitution, so acoustical ceiling tile is necessary. Cluster spaces provide central areas for all types of technologies, including large-screen displays, printers, and CD-ROMS.



Community use of schools. A survey of 100 small cities by the Pew Partnership for Civic Change found that schools were at the center of their most successful civic collaborations. The Partnership report concluded that community use of school facilities builds neighborhood cohesion, better relationships between schools and communities, and better teacher-parent contacts. In both small and large communities, school buildings can provide residents access to resources. What those resources are depends upon community needs—from recreation to necessary support services for families. In disadvantaged communities, parent centers within schools have helped to engage low-income families in the culture of the schools. In more advantaged areas, community recreational centers in schools helped build support for the public schools, according to one source.

Architects respond: Moore and Lackney suggest two models: in one, the school may wrap around various community functions within it like around a town square; in the other, the school is the community hub with services and activities around it like a necklace. An example of the former is the community-initiated plan for a school in Los Angeles' Watts area that is surrounded by essential community functions, such as elderly housing, a foster care home, a community center, a clinic, and a food cooperative. Architects also often try to mirror the community in materials and design, as in the kiva arrangements or in the use of cultural symbols where these are distinctive in a community, such as brilliantly colored sculptural effects in the Southwest. On the practical side, architects see joint use (e.g., open spaces that can be used in after-school hours for community meetings) as an economical design. In some areas, designs need to consider security needs.

SCHOOLS REPORTING THAT THEY DO NOT MEET REQUIREMENTS OF REFORM WELL



Source: General Accounting Office, *School Facilities: America's Schools Not Designed or Equipped for 21st Century,* 1995, 15.

Research Begins Filling Void

The research literature on causal relationships between school design and school reform is thin. Except on the issues of smaller schools and smaller classes, there is little information that says this design supports this kind of reform. Lackney's work is an attempt to translate research on school reform into workable patterns for school architecture, a task that is perhaps more reliable than it might have been in the past because the educational research is more reliable.

Facilities planners are continually improving how they assess community and educational needs. Sampling opinion or bringing many people into the process have both become common techniques. AIA's Roccosalva believes discussions about matching school architecture to school reform should begin long before the mention of funding. His approach is to do a video walk-through of existing facilities to show the community what is there, instead of "trying to dissuade them of what they think is there." Brady in Texas conducted a roundtable discussion, co-sponsored by Page, Southerland, Page and the University of Texas School of Architecture, that focused a broad group of participants on designing quality school environments that are "nurturing, engaging, flexible, and safe." The result was a "sketchpad" that can guide other communities as they discuss school facilities. The sketchpad suggests areas for consideration, such as learner-centered places that are appropriate for different learning styles,

encourage choice and creativity, and are challenging and intellectually stimulating. Architecturally, this means that spaces designed for today must be adaptable for a variety of activities and methods of learning.

One of the most promising initiatives to fill the void between architecture and school reform is the facilities audit developed by Roger Scott of the San Diego office of WestEd. Scott's premise is that school facilities planners, with educators, must take on the responsibility of "matchmaker," making sure that facilities match the reforms that are being introduced in schools. To do this effectively, planners and educators need to analyze (audit) the relationships between particular reforms and the school facility. Scott suggests that three questions frame the relationship between facilities and reform:

- What types of reforms are being considered?
- Which reforms are likely to involve many schools and endure?
- What does research say about the capability of school facilities to house these reforms?

Scott's audit synthesizes information about current education reforms and then asks what activities students, teachers, and others would conduct if one or more of the reforms were in place. It then goes on to identify the space features needed for these activities, such as shared teacher planning space or large-group instruction.

"We also considered the barriers in facilities that make it hard to do the reform-type activities," says Scott, "even though this was a judgment call because sometimes enthusiasts about a reform wouldn't care if it were done in a cow pasture." The audit was tried out in 15 schools with schoolwide Title I plans, looking at the extent to which these facilities could support cooperative learning, teacher professional development, greater parent involvement, and other reforms. In general, he says, the audit found inadequate facilities. Many of the schools were not designed to conduct the programs they already had, never mind more recent reforms. Some of the findings:

- Most schools were crowded and had inadequate space for staff development, counseling, health services, or presentations to large groups of students or parents.
- Most schools had no space for day care.
- Typically, there were too few electrical outlets, limited access (or none) to telephones by teachers, and inadequate lighting.
- Most schools lacked adequate storage space.

Scott also conducted a facilities survey of California high schools. These results show that a large percentage of schools in the survey are not prepared to accommodate many of the reform ideas and activities being promoted nationally. Fewer than one-third of the state's high school facilities were capable of supporting all-staff workshops, day care, or Internet access. The data also illustrate that schools serving poorer students are even less equipped for reform. These schools tend to be older and have larger enrollments, less technology and less space for workshops, storage, and large group activities.

These results demonstrate the importance of considering school facilities in discussions of school reform, and vice-versa. The goal always needs to be a "good fit" between the school facility and the educational program it houses. Increasingly, educators and architects are beginning to recognize that. Someday soon, we may have the research to prove it.

School Sense

By Üllik Rouk

Color, lighting, and other elements combine to make up the atmosphere inside a school. But now researchers are finding that these same elements are also important to student achievement.

It's a well-established fact that the quality of learning depends on the quality of teaching. But other elements also come into play — some so subtle that they have received little or no attention in the dialogue about education reform.

These elements have to do with the physical environment inside the school. They encompasses such features as class size, the use of color, lighting, acoustics, and furniture.

Educators and architects are learning that these familiar elements — usually selected for aesthetic appeal, functionality, durability, or cost — are part of a complex web of psychophysiological interactions that influence how teachers and students feel about their school, how motivated and productive they are, how they behave, and how much they achieve. Attending to them early on in the design of school facilities can save school districts money later on and, more important, create more productive learning opportunities for students.

Environmental psychology is a fairly new science, and applying it to education is newer still. Education research has tended to focus on instructional methodologies and children's cognitive development, virtually ignoring the extent to which students' physical surroundings affect their learning. The assumption was that as long as minimum requirements were met, learning depended on interactions between the student and teacher and certain conditions in the student's home.

No Dispute About Class Size and Density

The major exception has been studies of class size and density, where there appears to be no dispute — small, uncrowded classes produce better educational outcomes. Students achieve higher test scores, especially in reading and mathematics, interact more with teachers and peers, have more different kinds of interac-

tions with teachers, and express more positive attitudes about school. One group of students gained six percentage points in achievement after the number of children in their classes was lowered from 30 to 20, and 13 percentage points when it was reduced from 20 to 10 students.

Students in large, crowded classes, on the other hand, tend to be more dissatisfied with school, have fewer social interactions, and show greater aggressiveness.

Generally speaking, however, the research varies on how small the ideal classroom should be. A great deal still depends on the education program within it. And for much the same reason, today's school architects are reluctant to stipulate the square footage required per student, preferring that decision be based on the activities planned for a space.

School facilities planners have now begun to turn their attention to other classroom elements. For example, some are investigating the idea that if such features as color and light can boost productivity in health and business settings, they might be able to do the same in learning settings.

Color Takes on New Function

It's a rare school district, indeed, that has the funds to call in a professional color consultant. Instead, when most schools get ready for a new paint job, they leave the choice of color to administrators, teachers, or the district maintenance department. In the case of a new school, an architect's recommendation may be rejected just as easily as it is accepted.

But color is more than a decorating detail. Studies have shown that different colors stimulate the senses in different ways, and some colors inspire learning more than others.

The prevailing theory used to be that school colors could be discreet because, after all, it is children that breathe life into a school. That kind of thinking, though, has since been discredited. Today we know that children respond to impersonal classrooms with fidgeting, irritability, nervousness, and lack of interest. Bereft of appropriate stimuli, they engage in off-task behavior that does nothing to benefit either their own learning or that of their classmates.

New color theory is more functional. It goes something like this. Warm and luminous colors produce centrifugal action, which directs students' attention outward toward the environment. These colors are conducive to

The colors used in classrooms can influence how well students learn.

cheerfulness and activity. Softer, cooler colors produce centripetal action. This fosters an inward orientation and the ability to concentrate.

Some school planners are beginning to use this knowledge about the psychophysiological factors of color to plan the interiors of schools and classrooms. Instead of high-utility white with its reflecting and sterile nature, experts suggest much softer colors that inspire students to work harder and achieve more.

They recommend light salmon, warm yellow, pale yellow-orange, coral, and peach for elementary schools. In the upper grades, beige, pale or light green, and blue-green are appropriate.

Pale or light green are favored for libraries because these colors create a passive effect that enhances quiet and concentration.

"Visual Noise" Bombards Students

One of the first studies on the physiological and behavioral effects of color was conducted in the early 1980s by Canadian researcher Harry Wohlfarth. Wohlfarth found that while many teachers spent a lot of time and money making their classrooms bright and stimulating places for learning, their efforts had just the opposite effect. Bright, disharmonious, primary colors, and classrooms cluttered with posters, wall decorations, charts, alphabet letters, number lines, and other objects, many of them laminated so they cause glare, bombarded students with "visual noise."

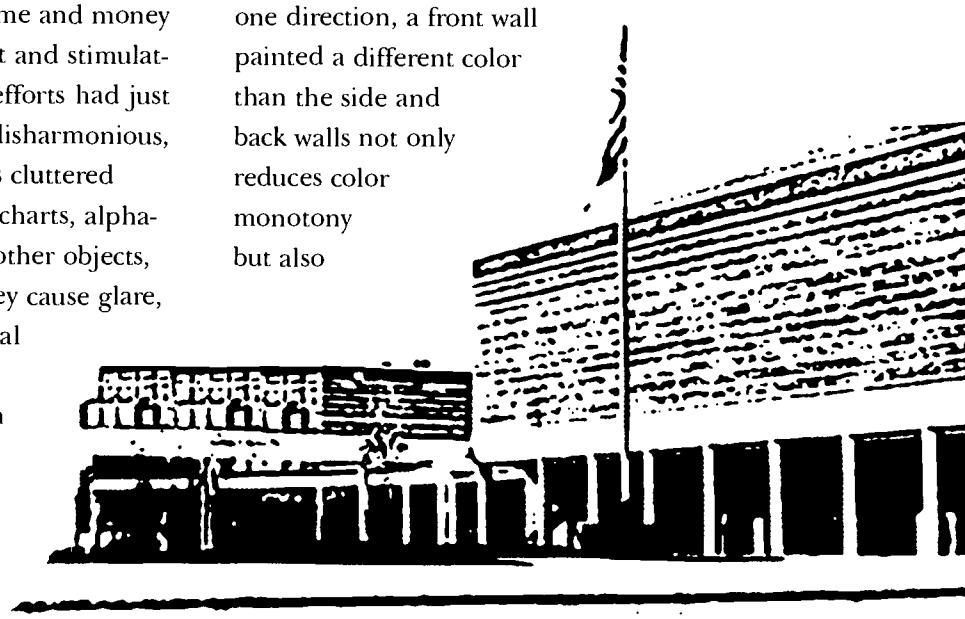
Instead of paying attention to the lesson, students' visual focus wandered about the room. Some appeared to be daydreaming while others bothered classmates around them, fidgeting about in their chairs clearly not concentrating on the lesson.

Other researchers later confirmed Wohlfarth's findings, positing that the only elements that should be within children's visual space are the materials on which they are working.

Color Coherence Easy on Eyes

Some research on the use of color has focused on wavelength. For many years, psychologists and color theorists thought that the longer a color's wavelength (red has the longest wavelength), the stronger its arousing effect. As the wavelength shortens so does the arousing effect (blue has the shortest wavelength). New research indicates, however, that this arousing effect does not last. The use of one color from any part of the spectrum becomes monotonous. A much better way to affect behavior, the experts now say, is to use a variety of colors — without overusing them. The important consideration in the use of color lies in achieving coherence.

In classrooms where students all face one direction, a front wall painted a different color than the side and back walls not only reduces color monotony but also



relaxes students' eyes by providing contrast and draws attention to the front of the room. Some architects suggest that side and back walls may be beige, sandstone, or light tan, while the front wall might be a medium tone of gold, green, blue, or terracotta.

Psychological color tests have shown that children accept or reject certain colors depending upon their level of maturity. While no one suggests that children's color preferences be used for wall colors, the judicious use of children's favorite colors as spot color or trim can make the school a more friendly place for students.

Heinrich Frieling of the Institute of Color Psychology studied 10,000 children, ages 5 to 19, from all over the world to discover what colors they liked best. Frieling found that children between the ages of five and eight most often selected red, orange, yellow, and violet over black, white, gray, and dark brown. Nine and ten-year-olds favored red, red-orange, and green-blue, and rejected dark brown, black, pastel green, and blue. The 11 to 12-year-old crowd dismissed black, white, gray, olive, violet, and lilac. At ages 13 and 14, their favorite colors were blue, ultramarine, and orange.

Using children's favorite colors as spot color or trim can make school a friendlier place.

Color Mixes with Sound and Temperature

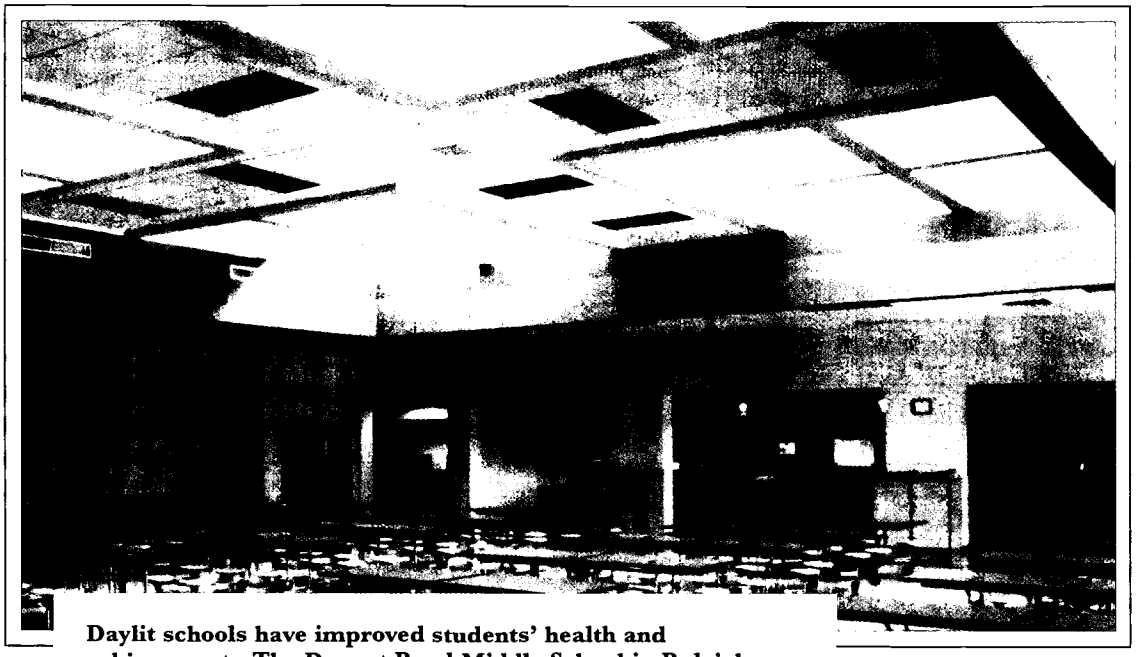
Colors are also associated with other senses. Loud sounds, for example, are associated with warm colors while the reverse is true for cool colors. Facilities planners of the Hunterdon Central Regional High School in Flemington, New Jersey, used red as a primary accent color in the cafeteria because red is known to stimulate the appetite, increase metabolism, promote extroversion, and dissipate tension.

Studies have also looked at how the color of a room affects people's perception of hot and cold. Johannes Itten found that people in a workroom that was painted blue-green felt cold at 59 degrees, whereas in a red-orange room the temperature was able to drop to 52 degrees before they felt cold.

In another study, employees in a cafeteria with light blue walls complained of cold at 75 degrees, but when the walls were repainted orange, they considered 75 degrees too warm. They preferred that the thermostat be turned down to 72 degrees. Similarly, researchers in Norway found that people set the thermostat 4 degrees higher in a blue room than in a room painted in warm colors.

Humans Need Natural Light

The effect of lighting in a learning environment has to do with a lot more than students' visual comfort. There is mounting evidence that lighting also affects student behavior, health, and academic performance.



Daylit schools have improved students' health and achievement. The Durant Road Middle School in Raleigh, North Carolina, features a daylit cafeteria.

For many years, architects designed classrooms without windows to save energy, reduce vandalism, and remove outside distractions from students' view. Students and teachers were boxed in, totally cut off from the rest of the world.

These designs were particularly popular during the energy crunch of the 1970s. But research published in the *Journal of Environmental Psychology* is very clear that "windowless classrooms should be avoided for permanent use." This premise is supported by medical doctors who, in the *Archives of Internal Medicine,* report that humans have a biological need for windows.

Rather than being a distraction that disrupts students' learning, transitory window gazing relieves tired eyes and intense levels of concentration by requiring what psychophysiologists call "soft" attention. Soft attention is less consuming than the fixed attention students might use to draw pictures or "doodle" in a notebook. It is much easier for students to refocus their attention on the teacher after a few moments of soft attention than it is after engaging in activities that require a more pointed focus.

In some schools where vandalism is a problem, architects have designed classrooms so that they face an inner courtyard, with skylights supplementing natural light.

Numerous studies, several from the National Institute of Mental Health, indicate that illumination levels in typical schools can cause teachers and students to become lethargic, irritable, and depressed. Illumination levels provided by the skylights have been found to reverse these effects, helping to keep everyone alert.

Studies by Warren Hathaway have noted the ill effects of poor lighting on neuroendocrine functions, hyperactivity, health, and on-task behaviors. Fritz Hollwich concluded that artificial illumination that deviates from natural light may be the cause of agitated mental and physical behavior in some children.

Daylit Schools More Healthy

Recent improvements in lighting technology such as daylighting and "smart" sensors, halogen, and "up lighting" have reduced energy costs and shown improvements in student performance.

Research on the positive effects of light on school children began in the early 1980s in Alberta, Canada, and since then, has been supported by other studies. The most recent study, conducted by the Alberta Department of Education between 1992 and 1994, compared the health of children in classrooms with full-spectrum light and more typical electric lighting. Full-spectrum light has all the characteristics of daylight, including vitamin D, an essential nutrient for growth. The results showed that under full-spectrum light students attended school 3.2 to 3.8 more days per year, had nine times less tooth decay, grew an average of 3/4 inch taller over a two-year period, and had more positive moods and better academic performance than students attending schools with other lighting.

In addition, libraries with full-spectrum light were less noisy, due in part to children's ability to concentrate on their lessons.

A more recent study of full-spectrum lighting in schools focused on student performance. Michael Nicklas and Gary Bailey of Innovative Design of Raleigh, North Carolina, compared the performance of students in three middle schools that their firm designed for Johnston County, North Carolina, with student achievement in other schools in the same county. They found that students in classrooms with large windows and skylights that let in natural light outperformed other students in their school district by 5 to 14 percent on end-of-grade tests.

The daylit schools also used 22 to 64 percent less energy than non-daylit schools. The architects predict that, in one middle school alone, the district will save $500,000 over a 10-year period.

Good Light Avoids Computer Glare

Especially today when students spend countless hours in front of computer screens, color and lighting pose special problems. Glare and reflections on the screen make information difficult to read and force students' eyes to constantly adjust to changing contrasts. Headaches, visual fatigue, and eyestrain are common, often resulting in diminished performance and concentration.

Illuminating spaces with good indirect lighting is a solution. Indirect lighting gives off a soft glow instead of a bright spot, which is more apt to reflect glare on computer monitors. Painting at least the side walls of the classroom in neutral colors and giving students a place to relax their eyes also helps them make the visual adjustment from luminous computer screens to their desktops and other parts of the room.

Little Research on School Furniture

While extensive research has been done in the use of color theory and lighting in classrooms, other elements related to the environment have been the subject of much less inquiry. For example, along with color and light, furniture has a big influence on student concentration and learning. Yet, a lot of the school furniture in use today was designed before computers were put into classrooms. In today's technology environment, it behooves school planners to attend to ergonomics in the selection of furniture.

However, furniture designers still tend to focus on commercial and home furniture rather than furniture for schools.

The layout of furniture in a classroom has been shown to influence persistence, participation, and student attitudes toward learning and toward other students. When student desks are placed in traditional rows, the focus is on the teacher as the purveyor of knowledge; small groupings of desks encourage student interactions and cooperative learning; secluded study booths within the classroom cut down on visual and auditory interruptions, increase privacy, and focus students' attention on the learning activity at hand.

Minor design modifications in classroom layouts have been linked to changes in students' spatial behavior, increased interaction with materials, decreased interruptions, and more substantive questioning as the result of students focusing more on study materials and the teacher being more available to attend to their individual needs.

Excessive Noise Thwarts Reading

The location of schools and the location of classrooms within them are important for many reasons. One that has a great influence on students' learning is noise. While short-term noise is a distraction, the effects of long-term noise are more severe.

Children whose learning must compete with noise from busy streets outside the school have been shown to have abnormally high blood pressure, shorter concentration spans, more errors on difficult tasks, and a greater likelihood of frustration and giving up on tasks. Furthermore, as one study conducted in Los Angeles reported, the effects of noise on children's blood pressure does not lessen over time. Contrary to popular thought, children do not get used to the noise in their environment.

There are several explanations for these adverse effects of noise, some of which have direct bearing on student achievement. First, if students are unable to hear the teacher, they will miss important instruction. Also, students lose important instructional time if their teacher must stop instruction and wait for noise to pass. A third possible explanation for the adverse effects of noise, particularly as it pertains to poor auditory discrimination among students, is that students who endure a great deal of unwanted noise may, after a while, stop discriminating among all sounds, becoming inattentive to acoustical cues in general.

Reading researchers and teachers believe that this failure to discriminate sounds can interfere with children's associating verbal cues with written symbols, making it difficult for children to learn to read. And, not surprisingly, excessive noise is an especially serious obstacle among beginning learners, children just learning to speak English, children with learning deficits, and those with hearing losses.

It's Time to Talk

School facilities planners and education researchers have been slow to talk with each other about their separate findings on the effects of school environment on student learning. Together, we know much more about what affects student learning than is contained in the typical literature on school reform. That knowledge comes from investigations in education, physiology, psychology, sociology, and yes, architecture. Putting it together makes a lot of sense.

The Question That Won't Go Away

By Lynn W. Zempel

Communities and states, desperate for infrastructure funding, are seeking alternatives to voter-approved bond issues. PROBE looks at ways to take advantage of new financial instruments and global financial markets to finance school infrastructure.

For at least the foreseeable future, the education of most K-12 students will take place in school buildings. Not only are many of these buildings inadequate for today's technology needs, thousands do not even meet basic structural safety standards. The issue is not whether school districts across the United States need to renovate existing facilities or construct new ones, or even exactly how much it will cost. The problem facing school authorities — and the nation — is where will the money come from.

The Problem with Municipal Bonds

Although financial instruments and markets have changed radically in the last two decades, most school buildings are still financed in the same way as they were 100 years ago. School districts are raising the better part of their money for school facilities by issuing tax-exempt general obligation (G.O.) bonds, a type of municipal bond. General obligation bonds are secured by all of the assets, including tax revenues, of the issuing jurisdiction. They differ from municipal revenue bonds in that the latter are secured by revenues generated by the facility built. The issuance of G.O. bonds requires local voters to approve a bond referendum. But despite the pressing need for school financing, many communities have placed caps on their ability to issue debt instruments, while others have simply voted "no" on school bonds. *The Bond Buyer,* a newsletter covering the bond industry, reports that voters in 1994 approved $19.1 billion in school bonds, down from $39.8 billion in 1992.

The rise in "no" votes on school bond referenda stems from a number of causes, includ-

ing wide-spread resentment against tax burdens that the public considers too large, the drive for "balanced budgets," and an increasingly mobile population that takes little interest in the future of whatever community they happen to live in at the moment. The problem is *not* a lack of capital in the markets, but a lack of voter enthusiasm for "borrowing" that capital.

Meanwhile, the financial community has not focused on this issue, most likely because it has not yet figured out how to turn it into a source of future profits. Furthermore, there are those who doubt there is a more efficient way to finance schools. The problem, they argue, is not a lack of buyers for school bonds, which are regarded as safe as well as "socially responsible" investments. Anne Canfield, who represents the Association of National Guaranty Insurers, believes that the dilemma is not that schools cannot raise money, but how they spend it, that is, on administrative costs or consultants, rather than on infrastructure. "Where voters saw value," she said, "bond issues have been approved."

New Instruments and Markets Offer Alternatives

Increasingly, discussion is zeroing in on two broad approaches to financing the repair and construction of schools. One approach consists of employing alternatives to tax-exempt municipal bonds. The other is changing public perceptions about the urgency to finance school infrastructure so that more voters will pass school bond issues.

Agreeing to Lease or Lease/Purchase

For communities that do not have immediate funds available for new school construction, one alternative may be to lease facilities or enter into a lease/purchase agreement. This can be done by purchasing certificates of participation (COPs), a type of lease-back financing instrument similar to an installment purchase agreement. State and local governments are increasingly using COPs to finance property and equipment. For a school district, the key advantage is that COPs are not strictly debt obligations, and so, are exempt from direct voter approval and debt limitations.

In a COP arrangement, the school district makes lease payments over a set period to the lessor (who is, in effect, the lender). After it has made all its lease payments, the district owns the property. The lessor considers the lease payments to be the equivalent of principal and interest on a loan to a government agency. Since interest on state and local government borrowing is tax-free, the lessor does not pay federal income tax on that portion of the lease payments attributable to interest.

COPs add some of the desirable features of bonds, especially liquidity, to lease-backed financing. For example, to avoid being classified as debt, the lease must either contain legal language making it clear that if the lessee cannot use the property because, for example, it is damaged by fire, the lessee is not required to make payments. This classifies the lease payments as "fees for services" rather than debt. The lease may also allow the government entity to terminate the lease without penalty if the money to make payments is not allocated. As this gives the financing the character of a one-year renewable lease, it is another reason why most jurisdictions do not consider it a debt. Funds for paying off the lease may come from income produced by the project (not the case with schools), or from the general fund that includes tax revenues. COPs issues may be credit-enhanced by bond insurance or a bank letter of credit.

Creating Government-Sponsored Enterprises (GSEs)

Voters may be more apt to approve school bond issues if the cost of floating them could be reduced through credit enhancement or, to put it another way, by reducing the interest burden. One way to accomplish this is to establish a new federal Government-Sponsored Enterprise (GSE). GSEs purchase loans made by commercial banks and other lenders, and then sell securities backed by those loans. Because most GSEs have the explicit or implicit backing of the government, the securities they issue are considered safe investments and carry a relatively low interest rate. Selling loans to a GSE also frees up a bank's capital so it can make more loans. And since the repayment risk also has been transferred to the GSE, the bank can charge a lower initial interest rate. GSEs such as Fannie Mae and Freddie Mac have been extremely successful in promoting housing ownership and maintenance, and many people point to them as models for improving school infrastructure. However, the current political environment, with its emphasis on cutting government obligations, does not auger well for creation of a new GSE.

Seeking Private Secondary Market

It is, of course, possible to create a GSE that explicitly bars Treasury backing. In recent years, private entities have successfully established secondary markets in housing and student loans. (Indeed, Sallie Mae believes it can better serve bank lenders and borrowers by giving up its federal backing and priva-

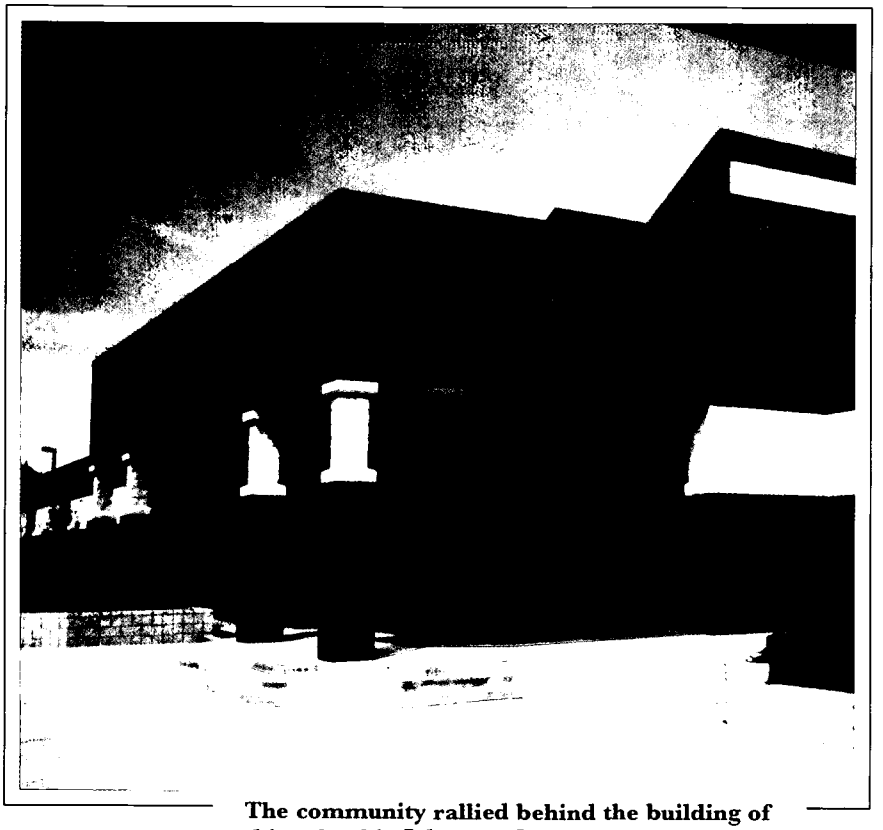
GROWTH OF CHARTER SCHOOLS RAISES NEW FINANCING ISSUES

About half the states now have some provision for establishing charter schools, some with more fiscal autonomy than others. Because charter schools do not generally receive money for infrastructure — buildings, furnishings, etc. — from local districts nor can they issue bonds or assess taxes, funding is a major consideration. Some states also impose restrictions that, in effect, require charter schools to lease facilities. In Minnesota, for example, charter schools may not use any state funds to buy a facility or property, nor can they accept any private funding once they are established.

For now, most charter schools draw on their operating budgets to provide and maintain their facilities, but the combination of state imposed limitations and high levels of parental involvement may result in innovations not yet conceived. Current ideas center on giving charter schools special bond authority or establishing state loan programs, but these seem to be fraught with practical and political drawbacks. One possible development with far-reaching implications could be the funding of all schools directly, rather than through school districts. In a recent paper on "Emerging Issues in Charter School Financing," co-authors Mary Fulton of the Education Commission of the States and Louann Bierlein of Louisiana State University note that not only could the charter school movement affect educational funding in general, but charter schools could serve as laboratories to determine the feasibility of funding each school individually, and what that could mean for student performance.

tizing. True, private entities cannot do business as cheaply as a government-backed program — and therefore cannot lower costs as much — but they can be efficient and profitable, as witnessed by the spread of private-sector secondary markets for everything from auto loans to credit card receivables.

One model that may make sense for financing school infrastructure is the School Development Bank recently approved as part of telecommunications reform legislation. The act authorizes this new, non-profit corporation to provide financing for upgrading technology in schools. The underlying purpose of the Bank is to leverage a relatively small amount of government funding that would create a private-sector market to issue taxable derivative securities. Local banks would make the initial loans, and the acquired technology (e.g., computers) or an equipment lease guaranteed by the state (or local) government would collateralize the bond issue. What makes the idea so attractive, according to James Murray of the law firm of Brown & Wood, a key player in the Bank's creation, is that commercial banks could buy and hold these notes, providing a ready-made market for them in the community.



The community rallied behind the building of this school in Johnston County, North Carolina, but in many communities voters are saying "no" to bond issues.

Business/Community Partnerships

In some communities, local businesses have voluntarily stepped in to stimulate classroom renovation or construction. For example, in North Carolina, the Kerr Lake Home Builders Association of Vance County donated materials and labor to add a day care training facility to a local high school. In adjoining Granville County, Revlon and other companies with local plants provided funds for equipment, teacher bonuses, and other expenses — thus freeing up scarce funds for school infrastructure projects.

In urban areas, where city planners are trying to recreate mixed-use neighborhoods, office building owners might be offered some sort of tax relief in return for dedicating space (e.g., an entire floor) to classrooms. The school district would retain responsibility for staffing the facility and providing materials, but would not have to ask taxpayers to finance a new structure. Such an arrangement — under

which both neighborhood and employees' children would attend classes at the site — could also attract new residents to the area. That, in turn, would improve the local tax base and, potentially, provide more school funding.

Establishing Revolving Funds

Some finance experts suggest that states or the federal government establish revolving funds from which money for school infrastructure could be borrowed at little or no interest. Eligible jurisdictions could borrow money to finance construction immediately, without having to wait for bond approval. Proponents of this method believe that revolving funds would especially benefit districts that need urgent repairs. The money could be repaid from future bond issues or other revenues, such as taxes, much like in recent federal highway legislation that established infrastructure revolving funds for bridges and roads in some states. Since community schools cannot charge tuition or otherwise generate sufficient revenues, they would still need to issue bonds to pay back the revolving fund. And that raises questions about a jurisdiction's obligation to repay, as well as political repercussions if it does not.

Imposing Impact Fees

Some fast-growing jurisdictions, including Arizona, have considered imposing school "impact" fees on new homes. Many communities already assess fees against developers for new streets and sewers. There are those who say it makes equal sense to impose a surcharge for new or expanded school facilities to accommodate the influx of new residents. Developers, of course, pass such assessments through to home buyers, thus driving up housing prices. However, while school impact fees shift much of the cost burden from a broader taxpayer base to those whose children will attend the schools, developers — who tend to be well-organized and politically influential — oppose the idea. And while impact fees help growing districts absorb growing school populations, they would not benefit "mature" communities that need to replace or renovate existing facilities.

Increasing Direct State Aid

Given the historical emphasis on local responsibility for schools, it is not surprising that only a handful of states earmark significant state income or general tax revenues for school construction. Such money generally accounts for only a small percentage of a school district's building budget (except in California where a significant percentage comes from state). There is, however, increased attention being paid to the concept of replacing local property taxes with a small (e.g., one-half of one percent) state-wide sales tax that would be used to finance bond issues. Each district would get a fixed amount, say $10,000 per student, and in some cases, districts that save money on construction costs could use the "surplus" for other classroom expenses, including teacher salaries.

Several states have turned to or are considering using more direct aid. In 1994, the State Supreme Court ruled that Arizona's system of financing school construction was unconstitutional because it relied solely on property tax raised locally. That, the court said, created inequities between school districts with high property wealth and those without it. In response, the state established a State Board for Capital School Facilities, which met last July to distribute $100 million allocated by the state legislature to improve the "most deteriorated" facilities, and thus redress the inequities. However, that distribu-

tion is being challenged in the courts as inadequate, and the state continues to consider alternatives.

In West Virginia, on the premise that the need for new and improved school facilities is a state-wide, not a local, problem, the state created a school building authority in 1989. Since then, the agency has issued state bonds for $470 million in construction funds and pumped $509 million into its school facilities improvement program. In addition, the agency assisted local entities in raising another $211 million through bonds or taxes dedicated to school infrastructure.

Because these approaches are variations on state-wide equalization formulas aimed at evening out inequities between rich and poor school districts, they are extremely controversial. Districts that have taken advantage of such formulas for relatively minor acquisitions, such as playground equipment, have set off storms of protest from taxpayers resentful that their money was aiding other localities and violating the principle of local control.

Expanding Existing Programs

It has also been suggested that some resources not currently aimed toward school infrastructure financing could be pointed in that direction. For example, the Agriculture Department's Rural Development Administration (RDA) provides low-cost, 40-year loans for constructing community facilities. An RDA spokesperson said that the program has been used to finance school construction in rural areas only on a very limited basis. RDA, she added, would consider doing more, but by law, its borrowers must demonstrate they cannot obtain credit elsewhere. However, the criterion is whether raising funds is "feasible," rather than merely legally permissible.

Similarly, one mandate for the new community development banks (CDBs), which have received federal funding as part of a pilot program, is to provide loans for community facilities. But CDBs have not really looked at schools.

Making Munis More Attractive

The solution to school building repair and construction may not be in alternatives to municipal bonds, but in making bond issues more palatable to voters. According to Leonard Skov, Professor of Educational Administration at the University of Nebraska at Kearny, the key may be to tax income, rather than property values, to raise money for schools.

According to Skov, up until now property values have served as reasonably accurate indicators of people's ability to pay property taxes. But that is not always the case anymore. The reason, he says, is that the assessed value of property may not reflect the owner's income and ability to pay taxes. This is especially true in rural areas where farmers may be land wealthy but have an erratic cash flow, or in communities with a large population of older people who have a lot of home equity but little income. Skov noted that "Getting bond issues passed is getting tougher and tougher. We lose slightly more than half of them." He lays some of the blame at the feet of the education community itself. People in education don't always do a good job of "getting folks ready" for a bond issue vote, he said. What they need to do, Skov believes, is to build a better connection between the school environment and learning, and to establish programs designed to give voters an increased sense of the schools as an integral part of the community.

Managing in the States

By Brian Curry

Poor schoolhouse conditions are being compounded by surging student enrollments, leaving states and school districts to find creative solutions to the problem or face the courts.

In 1989, the Education Writers Association (EWA) published *Wolves at the Schoolhouse Door,* an investigation into the condition of America's schools. The findings told of a United States busy developing schools for the 21st century. But the study also pointed out that only a very small percentage of public school students will ever attend these modern, state-of-the-art schools. In fact, most will spend their time in old, worn-out, in-need-of-repair buildings that are in that condition precisely because of the postponement of repairs and competing budget priorities.

Now, some seven years after that study, the poor condition of America's schools is compounded by unchecked growth. States and school districts are being forced to respond. Few, however, are in any position to do so. According to the General Accounting Office (GAO), only about a quarter of the states have a comprehensive school facilities program. Facilities offices in state education agencies have often been victims of downsizing, with personnel cuts as large as 50 percent in some states. In 1994, states legislatures appropriated only about $3.5 billion for facilities, a fraction of what the GAO says is needed to get schools to where they are safe and suitable.

Arizona Court Rules on Facilities

Equity suits have historically focused on variations in per pupil expenditures among a state's school districts — variations that generally result from differences in property wealth. Property-poor school districts have long argued that in order to spend as much as rich districts, they have to tax themselves at a higher rate. In the last few years, over 20 states have been or are currently involved in school finance litigation. In some states, including Arizona and Ohio, inadequate school facilities were a pivotal factor in declaring school systems unconstitutional.

In 1994 Arizona became the first state to have its school funding system declared unconstitutional because of the condition of school facilities. The state Supreme Court said that the disparities in school buildings were a result of reliance on the local property tax for capital outlay and that, although a portion of each district's state equalization aid was budgeted for capital improvements, poor districts often found it insufficient.

The court did not find the property tax itself unconstitutional. Rather it said the state had failed to offset disparities in property wealth, violating Arizona's constitutional obligation to provide a "general and uniform" education.

The state Supreme Court ordered the legislature to reform the way school buildings are financed. As a result of the ruling, in 1995 the Arizona legislature hired MGT of America, a consulting firm, to conduct a "School Capital Needs Assessment," a district-by-district survey of school facilities. Results of the survey prodded lawmakers this past spring to provide $100 million to poor districts to help build and renovate schools.

A lawsuit on behalf of 70 property-poor districts, with state superintendent Lisa Graham Keegan as the main defendant, claimed the legislature did not adequately comply with the State Supreme Court order. Hearings began on October 1, 1996. In November a judge ruled that the current capital funding mechanism remains unconstitutional and continues to create substantial disparities among schools. The ruling stipulates that school funding laws must be changed to comply with the state constitution by 1998, or the superintendent and the state Board of Education will be prohibited from distributing any funds to schools, in effect shutting down the public schools.

Reliance on local property taxes for school construction has caused disparities in school facilities between property-poor districts and districts that are better off.

The ruling says any plan accepted by the legislature should have several key elements, including equitable funding per pupil, equally shared tax contributions, guaranteed revenue sources, and guarantees that funding follows students. Keegan says the state should use this as an opportunity to revamp school funding.

Ohio Court Addresses Dollars

Also in 1994, a lower court in Ohio overturned the state's school funding system, finding "school facilities" a source of inequity. As in the Arizona finding, the court in Ohio found that poorer school districts had to tax themselves at higher rates to produce the capital outlay funding available to more wealthy districts. The court eventually struck down the state statute for funding school facilities because it did not provide sufficient dollars for meeting facilities needs.

Several States Managing Growth Creatively

Large states like Florida, Texas, and California are struggling to manage the impact that climbing enrollments have on some of their districts. When schools opened this fall in Florida's Dade County, the nation's fourth-largest district, some 241 of 272 schools were over capacity, many with twice the number of students they were built to accommodate. Officials estimate that Dade County needs at least one new school a week just to keep up with current growth projections. Faced with these kinds of statistics, states are attempting to manage their crises in various ways.

Texas Option Draws Controversy

Soaring enrollments, particularly among non-English speaking students along the Texas-Mexico border, have caused some Texas districts to establish entire campuses of portable buildings. Growth in these areas is exceeding the rate at which the traditional funding, design, and construction process can take place. There has also been an effect on teaching staff and teacher certification requirements. In situations where there are no "state-certified" teachers available (as on the border), local districts are hiring "teachers" on a provisional basis.

In Houston, the nation's sixth-largest school district, school officials are attempting to face the crisis head-on. Of the options they developed to deal with increasing enrollments, including portables, Saturday school, extended day and year, half-day kindergarten, and redrawing school boundaries, none was more controversial than the superintendent's proposal to send some children from Houston Independent School District's (HISD) overcrowded public schools to private schools at district expense.

Immediately labeled as a voucher program, the Houston proposal is not without precedent. In Vermont for instance, districts that do not have their own high schools have been paying tuition to private schools for long time.

In September, HISD met with 16 private school operators in the Houston area to discuss overcrowding and what some administrators called private "satellite schools." Those schools expressing interest submitted proposals and on October 14, the first private school, The Varnett School, accepted 200 HISD students. Another 200 students began classes at the River Oaks Academy in February. HISD is also negotiating with a third school, Wonderland Private School in South Houston.

To contract with HISD, a private school must accept $3575 per student as full payment, accept all students sent to it, be accredited, take attendance, and administer the Texas Assessment of Academic Skills. HISD will evaluate the experiment this year to see if it warrants expansion in 1997.

The exception is Community Education Partners, a special alternative school for "at-risk" students, which is charging the district $7,500 per student annually, with the guarantee that it will boost them two grade levels. If it fails, Partners will re-educate the students at no cost to HISD. About 450 "at-risk" students are expected to be involved by the fall.

Texas also has new laws that allow different strategies for facilities design and construction. The previous facilities construction process followed the traditional design-bid-build strategy with the contract for construction being awarded to the lowest responsible

A ROLE FOR THE FEDERAL GOVERNMENT IN SCHOOL INFRASTRUCTURE?

By Neil Strawser

President Clinton's heavy emphasis on education in his State of the Union message is already raising many questions. Will his "national crusade for education standards" result in federal dictation of standards? Will his proposed budget and tax initiatives actually expand access to higher education, or will they merely subsidize students who would attend college in any case? Drawing somewhat less attention but also raising large questions is another element in the president's 10-point program — his proposal to subsidize up to $5 billion in bond-issue costs in order to help finance $20 billion in funding for school renovation and construction.

The president's school infrastructure program — first announced last July and repeated in the State of the Union address February 4, 1997 — was formulated in response to a series of General Accounting Office reports revealing that one-third of all public schools were in need of repair and replacement. "[W]e cannot expect our children to raise themselves up in schools that are literally falling down," President Clinton told Congress. "With the student population at an all-time high and record numbers of school buildings falling into disrepair, this has now become a serious national concern."

The Administration's budget proposal also includes $1.2 million for a new clearinghouse on school facilities. Originally funded in 1997, the clearinghouse will provide information on effective approaches for planning, designing, renovating, constructing, and financing educational facilities to state and local education agencies and other interested parties.

Traditionally, the federal government has done little in the way of helping construct or repair public schools. And while the president portrays his program as addressing what is now a situation of "serious national concern," the Administration, nevertheless, presents it as a temporary solution — a four-year-only program financed by a one-time sale of broadcast spectrum.

Some Democratic backers in Congress appear less cautious about establishing a federal role. Senator Carol Mosely-Braun (D-Ill.), an early supporter of federal aid for school infrastructure, said, "I don't think we have a choice" about a federal role. "Bond issues are failing all over the place. People are saying, 'My property taxes are high enough,"' she said. "If people keep thinking this is someone else's problem, we'll wind up hurting the national interest."

Representative Nita Lowey (D-N.Y.) said, "The federal government helps to build and maintain our nation's roads. Now we must fulfill our obligation to our nation's children and come to the aid of our schools."

Among Republicans, Representative John Porter (R-Ill.), Chairman of the House Appropriations Subcommittee on Labor, Health and Human Resources Education and Related Agencies, argued in an interview last fall that maintenance of

school infrastructure has historically been the responsibility of states and localities and should stay that way. He acknowledged the huge backlog of infrastructure needs as reported by GAO, but also noted that the federal government was (at the time) running deficits of $150 billion a year. "I see no way that the federal government can afford that [infrastructure aid] while we're running those kinds of deficits. We don't have the resources," said Porter.

In a letter sent to President Clinton on the day of the State of the Union address, Representative William Goodling (R-PA), Chairman of the House Committee on Education and the Workforce, and three of his subcommittee chairmen raised questions suggesting future challenges to the proposal for school renovation and construction. The first question focused on the infrastructure role:

"Is school construction and renovation a federal responsibility, or is it better carried out by states and local communities? It is important that any new construction program not jeopardize existing federal priorities nor over-stretch the nation's interest in a focused federal role in education."

Other questions suggested challenges on the merits of the plan:

"Would the proposal drive up school construction costs by imposing costly government mandates — such as mandating that unrealistically high union wages be paid on federally financed projects — ultimately costing taxpayers more and providing students with less?

"How does the proposal address the infrastructure concerns of rural school districts? Does it ignore rural districts in order to benefit urban schools?"

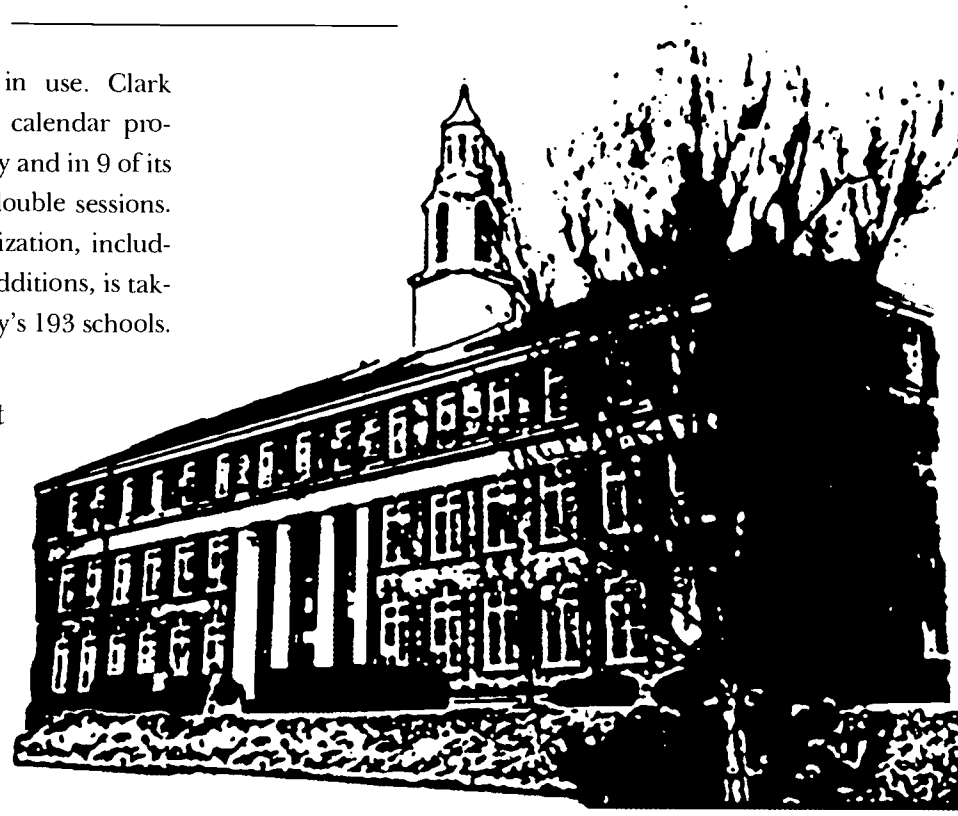
With Republicans continuing to hold majorities in both houses of Congress, it would appear that the Clinton proposal for a federal role in school infrastructure aid faces strong resistance in the coming year. But, said Senator Mosely-Braun, "The most important thing is that we begin a dialogue about the federal role."

bidder. The new law provides additional options, including requests for proposals, design/build, and lease/purchase arrangements. The state board of education determines what construction and design process will provide the "best value to the district."

Bond Issue Vote in Nevada

In Clark County, Nevada, public school enrollments have more than doubled over the past ten years. The district, located in the fastest-growing area in the country, is increasing enrollment at an annual rate of about 7 percent. Just this past year, the boom brought some 12,000 new students into the system and pushed enrollments to over 179,000. Clark County has adopted a myriad of growth management strategies, including year-round calendars, double sessions, and an aggressive building program, to keep up. Between 1988 and 1994 the county built 57 new schools. Today, as a result of a $605 million bond issue passed in 1994, 15 more schools are under construction and another 10 will be completed by 1998. Local residents will vote on a $643 million bond issue later this year to construct an additional 16 new schools to replace

some of the portables now in use. Clark County also has a year-round calendar program in 37 of its 136 elementary and in 9 of its 27 middle schools, and is on double sessions. In all, renovation and modernization, including the building of classroom additions, is taking place in 180 of Clark County's 193 schools.



Colorado Tests Impact Fees

Colorado and other Rocky Mountain states have recently bypassed traditional West Coast growth states in their rate of growth, due, in part, to their healthy economies, coupled with economic difficulties in California. In Douglas County, south of Denver, students in all but 4 of 23 elementary schools are on a four-track, year-round calendar. This has increased each school's capacity and has saved an estimated $60 million in principal and interest since 1984, when the first year-round school opened. Douglas also passed an $81.2 million bond in 1993 for new school construction. Another bond issue is likely to go on the ballot in November 1997.

Still, Douglas County is embroiled in controversy. Three years ago, county leaders, persuaded by school officials, levied an "impact fee" on developers and new home construction. Because each new home could mean potential new students and ultimately new schools, impact fees were a way to offset an estimated 10 to 15 percent of the cost of new school construction.

The arrangement is not unlike what developers must pay for water and utilities hookups, though these fees are usually passed on to buyers. (Only a few districts nationwide have impact fees, but several more, especially in high growth states like Florida and North Carolina, are considering them.) However, when impact fees were approved in 1992 through a joint agreement between the school district and county commissioners, the Homebuilder's Association contested the constitutionality of the fees in a lawsuit.

Because the lawsuit prevented the school district from collecting any fees directly, the Douglas County Trust Fund was established as a way for homebuilders to voluntarily commit funds. Some $20 million were collected. In December, the state Supreme Court ruled in favor of homebuilders on the legality of impact fees. It also upheld a lower court decision that bans the use of impact fees as a way to help growth pay its own way. The court held that counties do not have the authority to impose impact fees under current law.

In the meantime, however, impact fees have relieved Douglas County taxpayers of

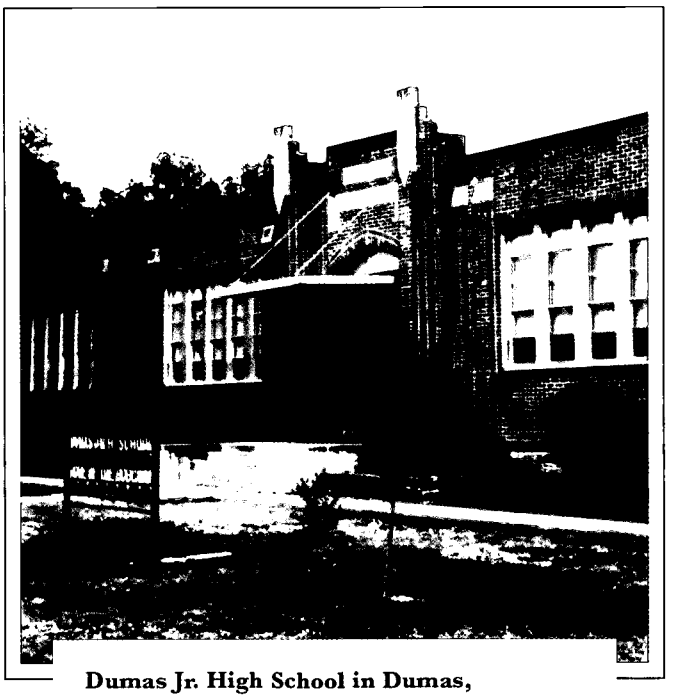
funding about $8 million in facilities. A bill introduced in the state legislature would allow fees to be collected until July, 1997.

Still, many people in Douglas County would like to do away with impact fees and are rallying around an amendment to a school funding bill to do just that. Meanwhile, those who favor the fees say their defeat would be another blow to Colorado Governor Roy Romer's "smart growth" policies because it would deprive citizens of a potential tool to help growth pay its own way. If, in fact, impact fees are banned, supporters of the fees believe two things will happen: the quality of education in fast-growing districts will decline since existing revenues will have to be diluted to accommodate newcomers, and the school district, county commissioners, and homebuilders must come up with alternative funding mechanisms to build new schools and maintain existing ones.

Classroom Crunch Pounds California

In California, school populations continue to grow. Approximately 140,000 pupils are expected to enter the public schools annually, and the California Department of Education says enrollment will exceed 6 million pupils by the year 2000. California currently has the most crowded schools in the country. Sixteen new classrooms need to be built in the state each day, including weekends and holidays, for the next five years just to accommodate the pace of new enrollments.

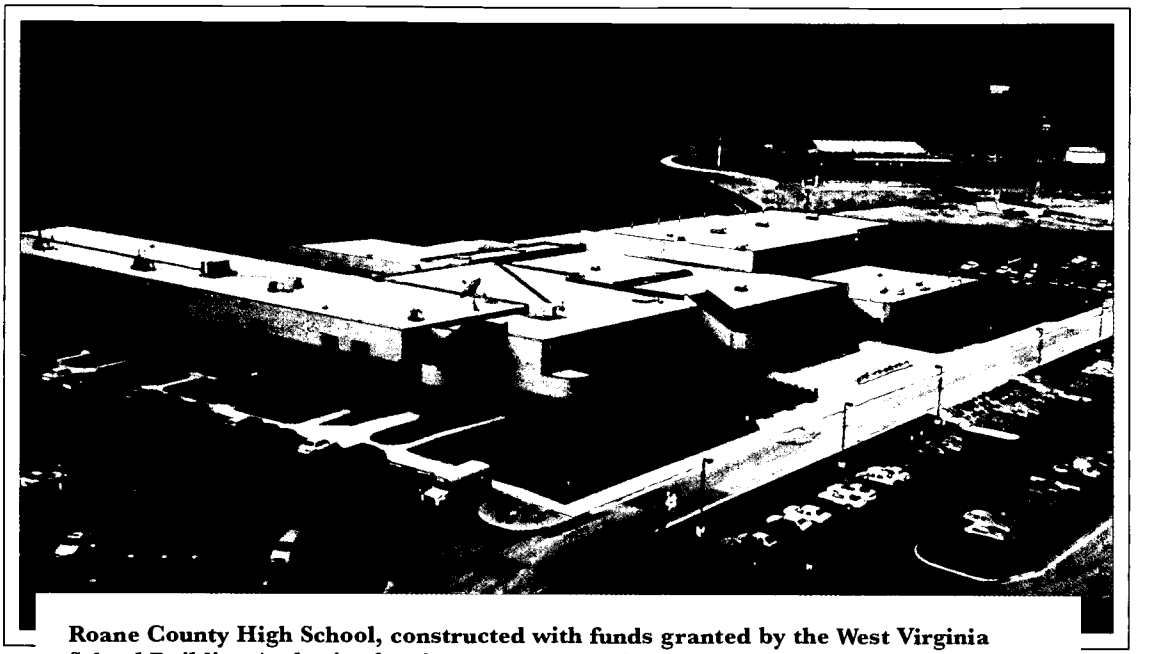
Funding school facilities in California has typically been a state and local partnership, with the local portion coming primarily from developer fees (impact fees), local bonds, and special taxes approved by voters. The larger part of the funding, however, has historically come from statewide general obligation bonds. A $1.9 billion school construction bond measure (Proposition 152) was approved by the voters on the June 1992 ballot; another $900 million school construction bond measure (Proposition 155) was approved by voters in November 1992. As an additional factor in the California growth equation, Senate Bills 1777 and 1789 created a new class size reduction program in July



Dumas Jr. High School in Dumas, Arkansas, will be torn down, and a new school built on the same site.

1996. This legislation provided $200 million in incentive grants for school districts that reduce class size in grades K-3.

The legislation affects growth and facilities statewide, as the vast majority of school districts have indicated that they will attempt to reduce class size to 20 students either this fall or by spring 1997. Schools were being provided incentive funding of $640 per student to reduce K-3 class size in September or



Roane County High School, constructed with funds granted by the West Virginia School Building Authority, has become a center for educational technology, community activities, county and regional sporting events, and satellite-delivered higher education programs. This school was among the pioneers bringing Internet services to rural America through a partnership with Bell Atlantic.

$325 per student if they decreased class size for half the school day.

The combination of reducing class size and enrollment growth could create a need for 43,000 new classrooms by the year 2000. Estimates are that 19,000 additional classrooms are needed to implement class size reduction. Another 24,489 classrooms are needed based upon Department of Finance enrollment projections.

In a state where, as of May 1996, funding requests by local school districts for land, new school buildings, and reconstruction or modernization totaled approximately $7.2 billion, with this legislation, many speculate an additional $4 billion for schools facilities will be necessary. Proponents advocate devoting $1 billion of that amount to building facilities to help reduce class size in the early elementary grades and using the rest to construct and modernize schools and wire them for technology.

West Virginia Looks Ahead to Economic Growth

West Virginia has not experienced an enrollment boom like some other states. In fact, for the past 20 years, enrollments have fallen, except in six rapidly growing counties mostly along the Virginia border. Where enrollments are growing, school officials are accommodating the larger numbers of students primarily with year-round education. But West Virginia has done something very few states have done. It has taken a comprehensive approach to growth (or lack of) and facilities issues by tying them to a state plan for creating a climate for economic growth and jobs. The West Virginia School Building Authority (SBA), established in 1989 as an outgrowth of a West Virginia Supreme Court ruling on inadequate facilities, assists in modernizing the state's physical infrastructure, identifies and addresses the

greatest facility needs in the state, helps counties operate schools more efficiently, and ensures equity in the distribution of capital outlays.

The state legislature through the SBA requires each district to develop a 10-year Comprehensive Educational Facilities Plan (CEP) that provides baseline data with which to make decisions. Data include the economic and demographic status of the community, existing schools and their future planned use, projected enrollments for a ten-year period, needed renovations, and new school construction. One of the primary roles of the SBA is to provide districts with state grants to meet their facilities needs, including consolidation of schools with declining enrollments.

School facilities that have closed in West Virginia are being sold, usually to the private sector, and becoming part of the tax base. In some instances, new industries and businesses are moving into old school plants, providing employment for the surrounding areas. In Wyoming County in the southern part of the state, one school plant was converted into an ammunition recovery center. Others are being turned into technical parks, community centers, and private day care facilities. Many of these conversions are taking place in high-poverty areas with a desperate need for economic revitalization.

Policy Issues and Growth

History illustrates that when overcrowding and space crunches hit schools and communities in the 1950s and 1960s, state and district officials generally relied on somewhat hasty, inflexible approaches to dealing with the crisis. As a result of cutting corners, many districts are today left with school sites that are unsuitable for their needs, do not lend themselves to alternative uses, and are old, poorly constructed, and in disrepair. Serious policy issues need to be addressed before responding to today's crisis with just more ill-planned solutions.

A very basic question revolves around the issue of growth, i.e., who pays for it? Should developers pay? Should there be some kind of concurrent arrangement among multiple funders who pay for new schools? Also, deferred maintenance and high cost are often cited as major reasons for the deterioration of facilities. Should LEAs and states agree on mandated maintenance schedules for certain kinds of maintenance, such as roof repairs? Another question is whether local districts have enough funding options. If not, what would help them better deal with the issues of limited resources?

Finding new space is indeed an issue. Acquisition of available, suitable land is becoming more difficult. A review of the kinds of flexibility that are found in state building regulations and codes may be in order. This is particularly important as more and more options like charter schools and other non-school sites become a part of the education landscape. Similarly, policies that either encourage or discourage partnerships and collaborations, lease purchase policies, and policies on flex time, alternative scheduling, and modified school calendars, all related to managing growth and facilities, should be on policymakers' minds.

Historically, states and LEAs experiencing high growth have learned that they cannot rely on only one strategy to solve their facilities problems. Rather, it is the comprehensive approach, a combination of cost-saving measures, innovative planning, timely maintenance, and the creative use of existing facilities that most likely will produce the best results.

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