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School design innovations which are presently realized or anticipated in response to changing demands on the educational process are discussed. Major topics include independent study, variety and flexibility in school spaces, school atmosphere, sound control and carpeting. New approaches in school building design are related to changes which are suggested for curriculum structures and the general approach to education. Discussion and evaluation is briefly provided for a number of examples of innovative school designs, including photographs, drawings, and floor plans. (MM)

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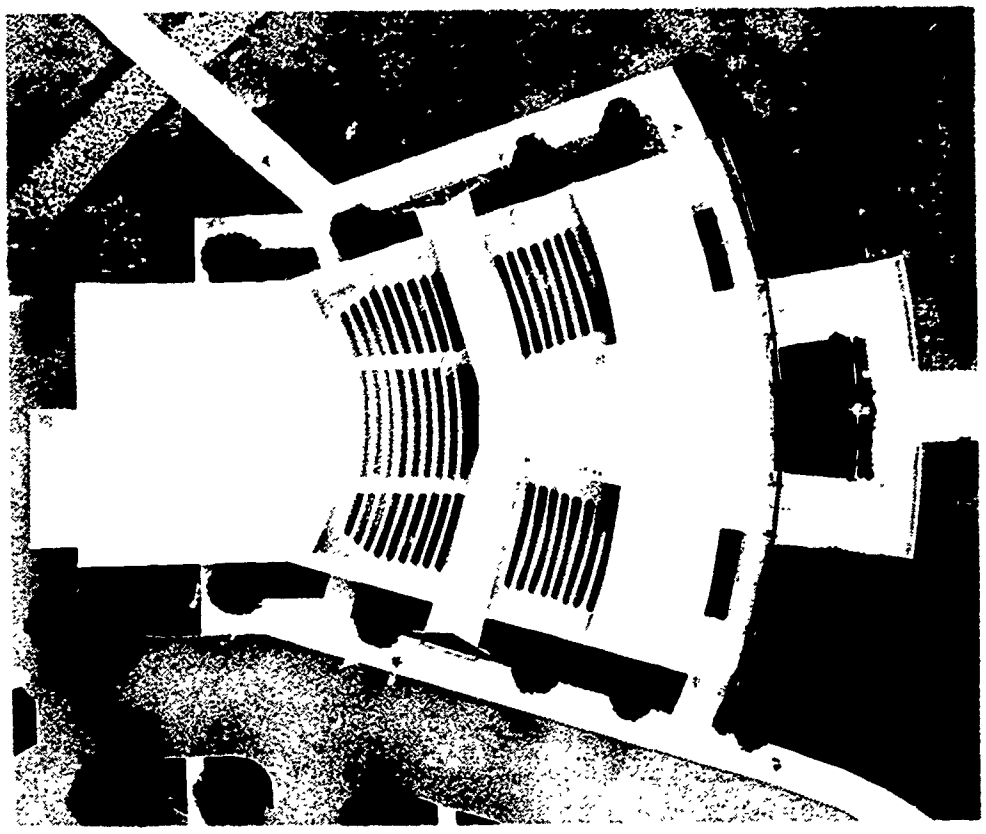
AIA *School Plant Studies*

BT 1-54

"Still Sits the Schoolhouse" . . . but less so



HAROLD B. GORES

President, Educational Facilities Laboratories

Adapted from an address given before the Georgia Chapter AIA in April 1963

One of a series of papers prepared by members of the AIA Committee on School Buildings, and by selected specialists, to make laymen aware of school building problems and trends and to stimulate discussions. They are not intended to be definitive last words and carry only the authority of their respective authors. New subjects are being worked on and contributed articles are welcome. Reprints of these non-technical articles are widely distributed to educators and interested laymen. One copy of each current issue will be sent free of charge—additional copies 10¢ each.

Reprinted from the December 1963 issue of the *Journal of The American Institute of Architects.*

THESE ARE VIVID TIMES. Because they are so vivid we suddenly find that the schoolhouse holds increasing interest these days. Whether attributable to Sputnik or not, is anybody's guess. But it is clear now, even to the man in the street, that we are in an international education race; that in the long run it won't be the hardware possessed by the military that will save us, but the amount of information possessed by the people. If education is becoming the first business of a modern state, it becomes very important to everybody that schools work well.

Recently I read a little book called "The Race to the Year 2000." It is a small book—a kind of poor man's Spengler's "Decline of the West"—in which the author tries to predict what will happen between now and the year 2000. One of the things in the book that struck me most vividly was that by 2000, one-half of all mankind will be Chinese and Russian. By that year, which many of us will observe, only about five per cent of mankind will be people we Americans call Americans. The United States may then bear the same relation to the world's economy that Switzerland bears today to Western Europe—a small band of decent people who succeed and prosper solely because of their industry and inventiveness. Since this may be our role in the year 2000—the Switzerland of the globe—our schools have got to work and work well.

Margaret Mead, the anthropologist, put the problem best when she said that in a simple society, where change is slow, the culture can be handed down economically from parent to child, father to son, mother to daughter. The whole bundle of social agreements—what's U, what's non-U and what's taboo—can be transmitted within the family and tribe with hardly the loss of a speared fish.

But when life gets complicated by the accumulation of more facts and more non-facts, it becomes more economical, and therefore more necessary, to assign the transmission of the culture to special people called teachers.

Miss Mead goes on to say that when life gets very complicated, when cultural change is exceedingly rapid, having older people called teachers teaching younger people called pupils is too sluggish an arrangement. In periods of rapid change everybody must learn from everybody else—the young from the old, to be sure, but also the old from the young.

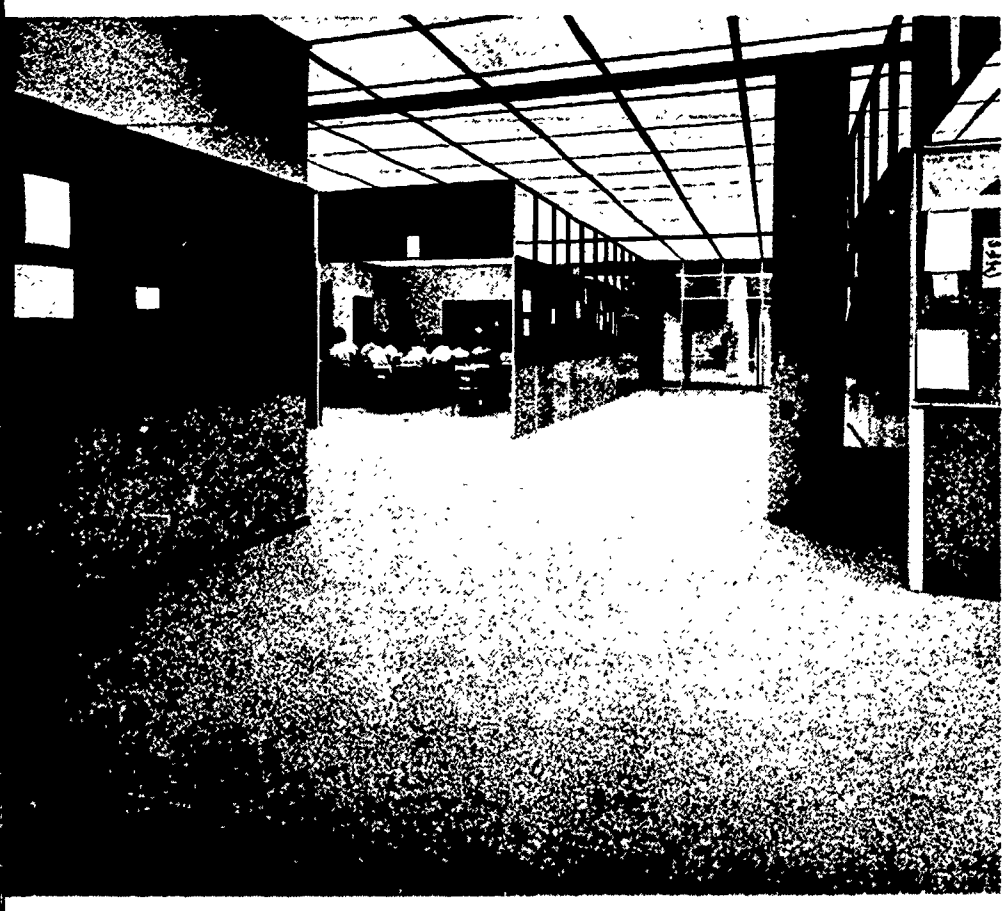
Consider the role of, say, a sixth-grade teacher today. It was only ten or fifteen years ago that a sixth-grade teacher could answer about every question a sixth-grader was likely to ask. How many legs has a grasshopper? What's the capital of Montana? How far away is the moon? Teachers had stored in their heads the encyclopedic facts of life and these were enough to get them through the day without loss of face from not knowing the answers.

Today, no teacher can be sure. There may be lurking in the back of the sixth-grade room an eleven-year-old demon who has been watching television or reading the more solemn columns of the newspapers and is ready to pounce with the question, "Teacher, the Russians are going to use solid fuel to get to the moon. Why are we sticking to liquids?"

If the teacher is a normal, well-adjusted, educated person, she won't have the slightest idea. She'd better ask the kid what he thinks and remember what he says. The situation requires that everybody learn from everybody, and the youngster must learn from everybody and everything. It may be just a shadow on a tube, a voice on a tape, a picture on celluloid; the point is he can now acquire information that doesn't have first to pass through the mouth of an older person called a teacher. This getting of information from inanimate sources is causing a revolution in schoolhouse design.

There are very sensitive schools, generally on islands in our culture here and there, where people worry about how efficiently the schools operate and to what extent a child can pursue certain parts of his education individually rather than always have it filtered to him through another person. We now see spaces devoted to independent study for those youngsters who are highly motivated, who have a thirst for knowledge. Last January a school opened in Blackwell, Okla, (the Blackwell Senior High School designed by Caudill, Rowlett and Scott) where *every single one* of the school's 600 students is provided with his own individual work place. These work places are physically arranged around the informational materials that students use to learn from, each in accordance with his own degree of curiosity, his own level of ability and his own pace of learning. The building that contains these work places is the central design feature of the entire school—the axis of the campus—the center from which all other activities radiate. Wasn't it Einstein who asked why

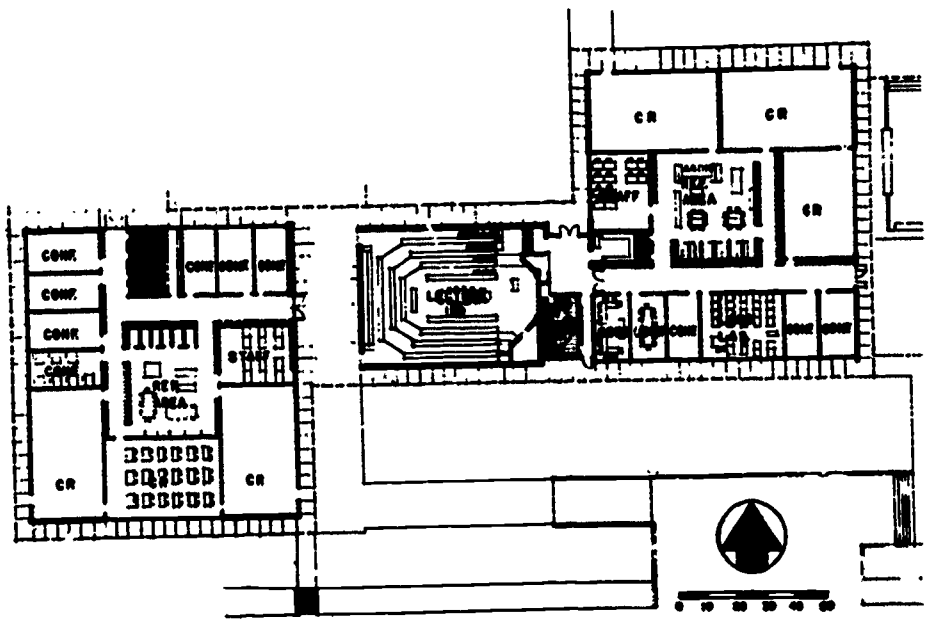
"The sensible thing to do is put the acoustic surface on the floor." Carpeting, used throughout open-plan school as an acoustic aid, at Andrews High School, Andrews, Texas. Caudill Rowlett & Scott, architects



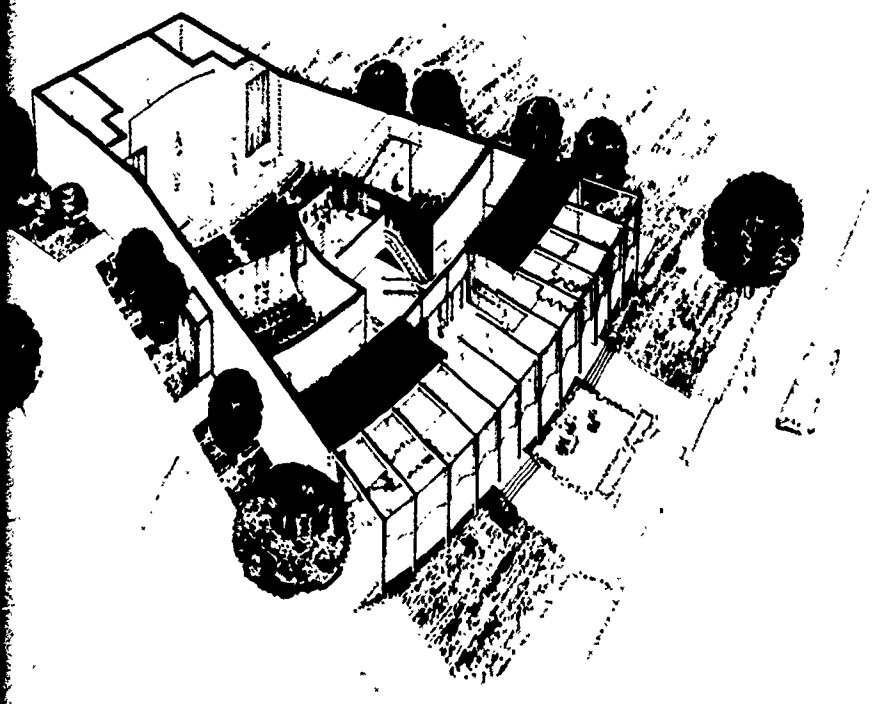
"You can create many types and sizes of sub-spaces, depending on what tasks a youngster should be doing and how many should be assembled at once." Wayland Senior High School, Wayland, Massachusetts, has its languages resource center and a language laboratory; space for large groups is provided in lecture hall, resource center has individual carrels around perimeter. The Architects Collaborative

schools are so operated that by the time a child has left grammar school, he no longer has a thirst for knowledge? If we are to keep them thirsty we must turn them loose to learn at their own pace.

Let me recall to your mind what the old schoolhouse really is. In general it is a big box filled with little boxes, of equal size, called classrooms. In some cities there are standards that say how long, how wide, how high the box is; frequently 24 feet wide and 32 feet long and 9 feet high. There are two schools of thought. One group likes square boxes, another group likes rectangular boxes, and bitter words can be exchanged over square versus rectangular boxes.



"If you need a partition in one of the very sensitive areas which demands visual or acoustic privacy, don't hesitate to use an operable partition." Operable walls in new auditorium of Boulder City (Nevada) High School mean that auditorium can be carved into instructional space, used most of the week. Partitions cut off noise from band practice on stage from instructional spaces in rear alcoves. Zick & Sharp, architects and engineers



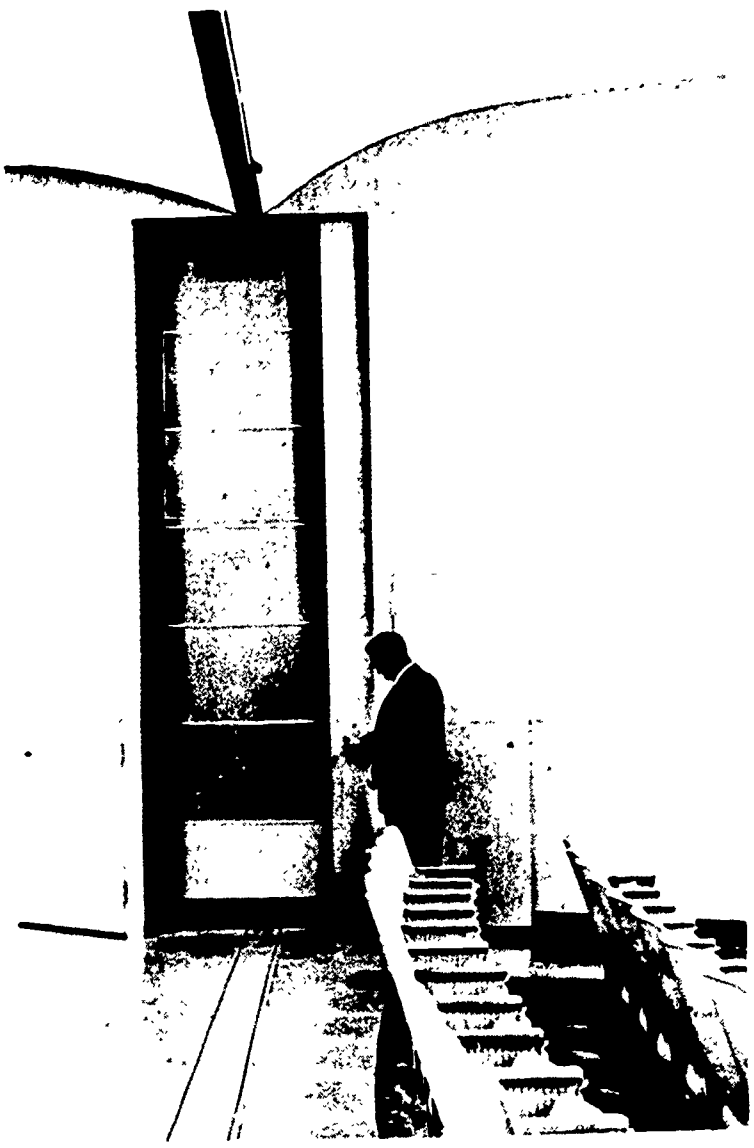
The very architecture sorts the children. It helps the administration to establish groups of a uniform size—twenty-five pupils if the community is rich, thirty-five if it is poor, and fifty if it doesn't care. This creates a problem. Let's say you have two second grades, and in one of the boxes (24 by 32 by 9 feet) you have the best teacher in the country—an old pro of fifty years of age who has a master's degree and can teach little children to read and to love to read. She's great.

On the other side of a four-inch partition is the next 24 by 32 by 9-foot box. This is the other half of the second grade. In this box is a teacher who graduated from Teachers College last June and was hired because she was a good scholar. In August she met a young man, in October she had a ring, in December she was married, in March she was pregnant, and in June she was out.

On one side of the four-inch partition the children had the greatest teacher in the country, and only four inches away the children had a teacher who couldn't even maintain order.

Query: Did those two sets of children have equal educational opportunity for one whole year of their lives?

In addition to classrooms, each school may have a cavernous auditorium that may not be in use more than 15 per cent of the time because its use is so specialized; a gorge-and-go cafeteria; a hangar-like gymnasium; a library (if there is one) will be the size of



two classrooms; a kindergarten (if there is one) will be one-and-a-half classrooms in size. These are the rules of thumb by which these eggcrates are put together.

If you walk through this school and take a fresh look, you would say that the design of the place derived from two desires—indestructibility and antisepsis. The floor is obviously chosen so that anything thrown down, or up, on it can be dealt with by the janitor with the greatest ease. The desks have Formica tops so that no errant scholar can unsheath his jackknife and leave any evidence that he had ever attended this place. There is factory lighting overhead.

I have been in schools that really don't have to be swept. They could be hosed down. The nature of the places showed that they weren't designed around people—around little children and the needs of the teacher—but were essentially the solution to a storage problem confronting the administration. Cost per square foot was obviously the criterion that set the tone of the environment—sterile, reverberative, reflective, hard—from which the youngsters get their notion of what America is about, and worse, what it thinks of them.

Many school systems I have visited are enchanted by what they call "standards." Standards give one a comfortable feeling. Too often "standards" mean one never has to rethink the problem again. It is decided, once and for all, how long a classroom is, and that is standard. When schools are frozen, the culture, too, gets frozen. In a time when cultural change is all around us, when all cultures are in a fluid state, it behooves us not to freeze the schoolhouse.

Here and there, though, I see some departure from stereotype and, interestingly enough, the structures don't cost any more.

The first great change I see is a change in attitude. In the past, we have looked upon the schoolhouse as a solution to today's enrollment problems: we have so many children and we need so many seats. But more and more, communities are now realizing that the new building will be standing, if it is well-built, to the year 2020 or so. Indeed, it may be only at halflife in the year 2000. The building will live through a lot of history if the next sixty years are anything like the last sixty. For the first time, we are getting a sense of prophecy in new schools. The architects and educators who are now designing them are giving consideration to the people who are to come after, rather than worrying only about how to solve the immediate problem.

At EFL we get some interesting mail which reflects the new perplexities. Frequently a letter will ask:

"We are going to be building a new high school. How do we design it so it won't be obsolete in twenty years? How do we design it so we won't have to take a hammer to it in ten years?"

"We are right in the middle of reevaluating our program. We are going to be making shifts in how we group and arrange the students. How do we design a school when we aren't sure how we want to arrange the youngsters?"

These are hard problems. The architect has a feeling of guilt when he designs flexible, mutable, malleable space. Someone will notice that it isn't particularly specialized and will say, "What's the matter—don't you know what a school is?" The educator has a similar sense of guilt because someone will say, "Why did you leave this space general? Don't you know what education consists of?" So it is with all the factors that freeze the details to fit this precise moment in time. The more precisely you fit 1963, the sooner your building will be obsolete—unless, unlike everything else in our society, your schools aren't going to change. But we know they are changing.

In 1958, I was superintendent in a small New England school system. We had only 18,000 pupils. But among them were two very bright boys who competed against each other all the way through school. In their senior year in high school they took the Westinghouse Science Talent Search Examination in which 25,000 youngsters competed. Surprisingly, these two boys came in first and second. *Time* magazine called up and said, "This is the first time in the seventeen-year history of the Westinghouse Talent Search that one high school has won first *and* second places. How did you do it?" The answer was a simple one: They were two bright students, and *the schools got out of their way*. For example, when the boys were ready for calculus, which was in their junior year in high school, they got it.

Operable walls in action at Sarasota Jr High School, Sarasota, Florida

Part of the problem in the design of schools (as with the curriculum) is to *get out of the students' way*. In the old days of stimulus-response, behavioristic psychology, we had everything so nicely planned we knew exactly at what grade level everything should be taught. Even today, in most of America, a student takes algebra in the ninth grade. If he is ready for it in the eighth grade, that's too bad. And if he isn't ready for it in the ninth grade, that's too bad; he takes it and flunks it.

Another example is biology, which is always found in the tenth grade. Our schools are traditionally set up in such a way that it is difficult, if not impossible, to give students access to subjects for which they are ready. We just don't go far enough in giving access to the youngsters who, for one reason or another, depart from the norm. However, schools are now coming along which will "get out of the way."

As I move among teaching groups I hear less talk about teaching and more talk about learning. Most schools are organized by standard groups—the youngsters confined to one room with one teacher all day; or, if it is a secondary school, the groups interchange every forty-five minutes or whenever a bell rings. But this standard groupism is breaking up. Now we are beginning to ask for spaces to which one child can go independently—for maybe an hour a day, or more if it is safe to let him; or small seminar group spaces that are appropriate for perhaps ten youngsters, where the cross-fire of discussion around the table can give the youngster the kind of experience he never gets if he is in a classroom of thirty-five youngsters where most conversation is in the recitation pattern of question-and-answer. We see some schools coming on the boards with designs for one-, ten-, thirty-, one hundred-sized spaces.

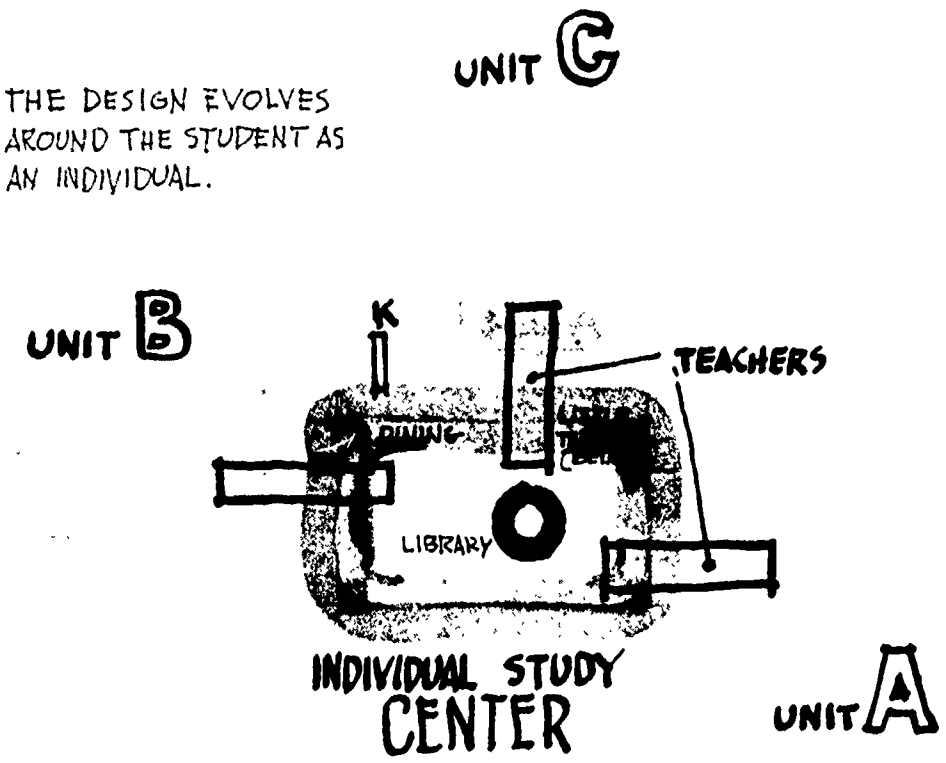
It is very difficult to have these spaces unless they are fully utilized. Therefore, we are getting requests for ways to get high multiple use of space. You can create many types and sizes of sub-spaces, depending on what tasks the youngsters should be doing and how many should be assembled at once. Recent developments in high-performance operable walls make this possible. Today's operable walls can be moved at will and at once, to provide immediate flexibility and acoustic privacy. Last year a new instructional center, a subdivisible auditorium, was opened in Boulder City, Nev. Unlike most auditoria which are empty, echoing caverns for 85 per cent of the time, this one can be used for large group instruction throughout the day. Electronically operated movable walls separate two 100-seat sections from the 300-seat central body of the auditorium. The walls, made of rigid steel sandwich panels with an insulative filler, weigh nine pounds per square foot and stop 40 decibels. A four-inch brick wall can do no better. This means that a class in history or English can be taught on one side while a band practices on the other, with absolutely no acoustic interference. At the turn of a switch, the original large space can be recovered within two minutes. Potential utilization of the facility approaches 100 per cent and the superintendent says it has saved the building of five additional classrooms. Other types of operable walls at Chicago Teachers' College North are used to subdivide thirteen instructional areas into smaller ones. There they have made possible an increase in the utilization rate of classrooms from an estimated 65 to 85 per cent. Some kinds of operable wall leak sound, but you can get walls that do not. About $5 per square foot will stop the ordinary sounds of instruction. If you have to stop more sound, it will cost more money. If you want to stop the sound of a band, it can be done for around $20 a square foot.

One of the great changes coming is in the nature of walls themselves. The first one, which everybody seems to embrace, is that interior partitions shall be non-bearing, acknowledging that some day someone is going to take a hammer to the place and change its interior. The difficulty is that so many people put in cheap partitions and then say that since they are cheap they can be broken down. But people have a sense of guilt about taking a hammer to a wall—especially if the building is on a twenty-year bond and isn't paid for yet.

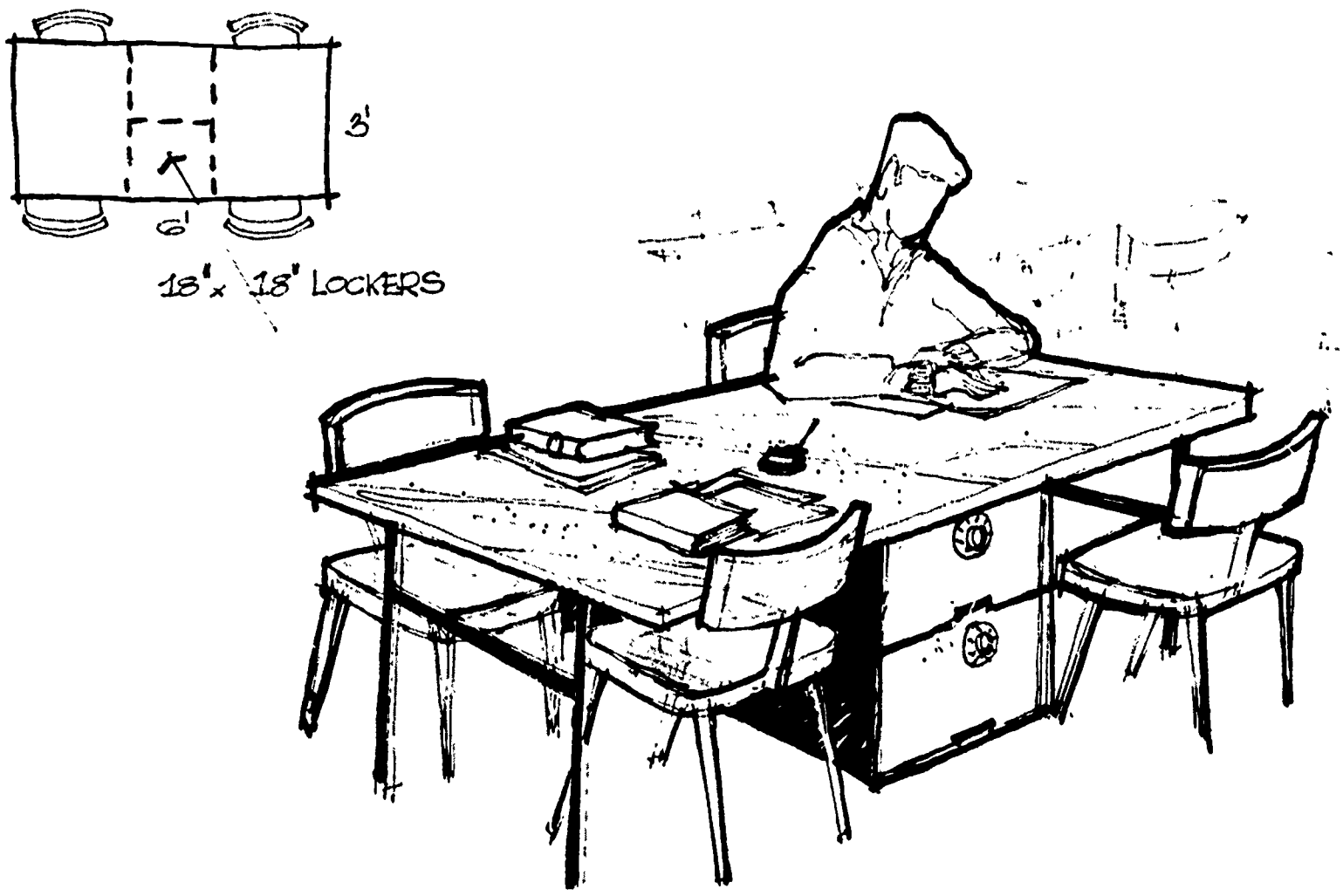
The taxpayer's memory is such that if you say you need a small appropriation to alter the partition, he says "Who put it up there in the first place?" But at least, if the interior partitions are non-bearing they can be taken out with the least cost. But if you can move to a kind of movable partition, which could be snapped in or out over a summer or a vacation, you will save money in the long run. If the need for a partition happens to be in one of the very sensitive areas of the school which demands visual or acoustic privacy, don't hesitate to use an operable partition.

One of the places EFL is working is Puerto Rico. The Puerto Ricans want to cluster four classrooms around a central library-like space, which will be the "toolbin" and will serve the four classrooms. Right now the classrooms are nothing but 26-foot square cement boxes—but by moving to the cluster, the Puerto Ricans will be ahead of almost anything we have in this country.

There is a general move toward change in schoolhouse design. I know of one "middle school" (which used to be called junior high) in which 50 per cent



150 units like these provide a home base for each of 600 students in the Individual Study Center, focal point of campus at Blackwell Sr High School, Blackwell, Texas. Caudill Rowlett & Scott, Architects



of the academic space is going to be library-type—not library, but library-*type;* a great zone of space.

Today there is pressure on the schools to turn out youngsters who know more than youngsters have ever had to know before. Yet there is a movement toward amenity, toward treating the environment as though it were cast up for people: we care a great deal about. We've never put schools together that have said to the child, "We think you're very important." Most of our schools say to him, "We think you're destructive."

Among the new things is acoustic, insulative floor covering. There is such a cultural guilt about saying "carpeting"—but look at the economics. Every study shows that carpeting can be maintained for about half of what it costs to maintain a surface that has to be waxed. In a six- to eight-year period it pays for itself in reduced cost of maintenance.

The floor is the chief reverberant drumhead of the room. To stop the noise of scuffing, scraping of chairs, things dropped and sound bouncing off the floor, the sensible thing to do is to put the acoustic surface on the floor. What we usually do, though, is put it on the ceiling. We put a blotter on the ceiling to catch sound bouncing off the floor. This is like putting an ambulance at the foot of a cliff.

Andrews High School, Andrews, Tex, has carpeted floors throughout the entire building because of the importance in its open plan design of trapping sound at its source—the floor.

In the opinion of Dr L. P. Herrington, an authority in thermal environment, use of carpeting can save five per cent of fuel costs. But though carpeting can lower fuel costs, can help schools get more light for their electric bills, and can quiet surroundings acoustically, it is difficult to convey to the general public the economic feasibility of such floor covering. The public just won't believe it. It would appear that the only place in the school where acoustic, insulative floor covering can be used—where people will understand—is the library. Nobody fights a book, and everybody agrees that library acoustics should be good, so libraries are getting carpeted without controversy. But for other spaces, our cultural attitude toward carpeting as a status symbol will have to change before it is politically safe to give children its benefits.

And this leads into climate control (or airconditioning, as some say) as our schools move from 1000-hour-a-year institutions toward year-round use. Airconditioning is an example of those so-called amenities. If it is planned for in the original design of the building, it can be had at little extra cost. Sometimes, even, it can be had at less cost than a traditionally designed non-airconditioned building. There is a high school for 750 (eventually 1250) students in McPherson, Kan, totally airconditioned, that cost $11.79 per square foot. That is $2.11 per square foot less than the average cost of twenty-two other conventional schools in the area, built about the same time. The key, there, was in the compact hexagonal design. Interior classrooms, made possible by the mechanical ventilation, reduced the perimeter and saved some 20 per cent of total wall space.

That brings us to the question of windows and glass. It is pretty clear that windows bear the same relation to light that fireplaces do to heat—the window, essentially, is an esthetic matter. The amount of exterior glass is being reduced in schools. If glass is "going out the window," we should bring it in the door. We don't begin to make enough use of interior partitions of glass.

I'd like to say a word here about educational specifications. At the moment, our architects are not getting hard enough questions asked them by the educators. Educational specifications tend to be confined to telling the architect what to do about height of the drinking fountains. What the architect really wants to know is, "What are you going to be *doing* in the place?"

New York University is building a new school in Washington Square, where land is $750,000 per acre. The educational specifications, or rather the instructions, they gave to I. M. Pei AIA went like this:

"We can't afford a site; we can't afford a playground; so cover the site with the building. But we want our site *back*—that is, the play space we would have had. So don't pile the building up on one corner, leaving a black asphalt playground surrounded by a hurricane fence. Let the building rise up so that we have several zones of space out of which we can snap, at will and at once, the kinds of spaces we want from week to week—day to day—and in some instances, hour to hour. Give us our playground by putting it on the roof where we can afford it."

(For the rooftop, EFL has encouraged the development of synthetic turf which looks like and feels like grass, but never needs mowing, sowing, reseeding or resting.)

Perimeter classrooms lead out onto balconies which provide outdoor work space for each classroom. It is quite possible that some day you may approach this building in its high-rise setting, and see it literally alive from top to bottom with the shrubs and flowers the children have planted. Even 80 feet in the air a sunflower is a sunflower, and the big city could use a few to diminish its brassy, glassy facelessness. There will be a good-sized tree planted in the center of the building, and the building will circle the tree. Truly, this school will bring chlorophyll and oxygen back to the city.

In sum: Build schools that function to the maximum. Encourage school boards to accept clustered space rather than boxes strung along the corridor like coaches in a train. Encourage amenity—the child will rise to his environment. Encourage flexibility—it's a long way both to Tipperary and the year 2020. I don't know any state where what I have described is the general pattern. But things are happening on islands here and there in this country. If we get enough islands started—maybe one school here and one there that break out of the lockstep—we're on the way to what Katherine Lee Bates, a school-teacher who wrote "America the Beautiful," may have meant when she wrote, "Thine alabaster cities gleam, undimmed by human tears." The children sing it in school; some day they should be living it. ◀

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