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School Spaces

In the last twenty-five years, school architects have had to respond to numerous educational innovations that have had both direct and indirect implications on the spatial needs of the teacher and student alike. These innovations include upgrading of the curriculum to include new courses, new methods of instruction such as team teaching, and new patterns of student advancement in non-graded or continuous progress programs. These innovations have made obsolete the traditional "egg-crate" form of schoolhouse consisting of a number of like-sized permanent classrooms placed on either side of a corridor.

In use for the past one hundred years, this spatial arrangement no longer adequately responds to the needs of all educators. New teaching and learning patterns have resulted in instructional groups taking new forms and, in some instances, in the disappearance of the regularly structured time-table.

These new patterns, along with the introduction of advanced educational tools, such as language labs and programmed teaching machines, have generated new architectural responses. In his recent book on schools, James J. Morisseau describes in detail the development of these responses.[1] He points out that the initial break from the "egg-crate" pattern was made to meet the requirements of *specific* educational reforms. Although considerably changed, the schools which resulted were often as rigid and inflexible as their egg-crate predecessors.

The initial response of the architect to the demand for varied sizes of instructional groups was the introduction of operable partitions between pairs of classrooms. This tentative solution enabled the teachers, by simply closing the partitions, to retreat to the traditional form, and while it appealed

to the more conservative teachers and administrators, it did little to support educational reform. However, it was a necessary step towards breaking down resistance to the proposed changes as it provided spaces in which to experiment.

The introduction of operable partitions eventually led to new shapes as designers sought ways of combining more than two classrooms. Still obsessed with the idea of retaining the traditional classroom, the designer went to extraordinary and expensive lengths to achieve flexibility through the use of these partitions. He experimented with clustering and found that by grouping three or four classrooms, larger spaces of a more useful shape could be created.

Eventually the need for a more flexible space led to the use of the "loft" space. This type of space, often found in light industrial buildings, is characterized by long clear spans with a minimum of internal supports. Specific internal spaces were defined by demountable partitions of a semi-permanent nature. The location of these partitions was not dictated by internal supports and hence more flexibility was achieved.

responses to the economic problem

The need for "loft" space involving a simplified structural system coincided with the development of an overall systems approach to the building of schools. Developed as a response to the increasing financial burden of funding school construction, the systems approach was formulated to enable schools to be built of modular, pre-engineered components. Such systems as those developed by the School Construction System Development in California (SCSD) and the Study of Educational Facilities in Ontario (SEF) should not be regarded as attempts to provide more flexible space but merely an attempt to reduce the increasing cost of providing educational facilities.

In the interests of economy, many other cost-saving innovations have been attempted. A particularly inhuman solution was the introduction of *windowless schools*. In criticizing windowless office buildings, Robert Sommer, a teacher of Psychology and Environmental Studies, pointed out that:

> Technical and scientific discoveries are responsible for some contemporary forms. The modern egg factory, a long windowless chicken coop, resulted from the discovery that Vitamin D added to the diet of chickens should replace natural daylight. No single break-through like this was responsible for the windowless office building.[2]

Although a clear saving in terms of material and construc-

tion can be realized from the elimination of windows, the cost in terms of the psychological effect on the users of the buildings cannot be minimized. Architects must be aware of the student's physical and emotional response to his surroundings — not only to heating, cooling, lighting and acoustics, but also to the visual and tactile environment. Surely, to fulfill all the requirements necessary for mental and emotional comfort and efficiency, these responses *must* include interaction with the external environment. Prolonged periods of enforced isolation from visual contact with the external environment in the interests of economy (and perhaps in a hoped-for decrease in distractions) are not an acceptable alternative.

interior ancillary spaces

One of the weakest aspects of school design has been in the treatment of the links between the formal learning spaces and ancillary interior and exterior spaces. It is imperative that designers abandon the idea that the walls of the classroom mark the boundaries of the child's learning. The teaching or learning area should be conceived as the whole school environment rather than as a series of individual semi-isolated spaces. This total approach to design for learning must extend to the boundaries of the school site and include a comprehensive design for the use of spaces exterior to the school building itself. Spaces other than those planned for formal activities appear to have been deliberately designed to decrease social contact. Reinforced by the rules of the school, corridors, for example, remain a means of moving from one space to another rather than being consciously designed to provide space to encourage interaction among students. Robert Sommer has concluded, with some sarcasm, that "Human contact in the form of casual conversation is a threat to order and a distraction to the assembly line."[3]

Ideally, links between formal learning spaces must become learning spaces themselves. They must be designed to increase informal social contact. Where corridors now exist, they must be renovated so that they can serve as work-spaces, sitting areas or play spaces. Non-teaching spaces presently represent more than forty percent of the area of schools. Areas not designated for essential non-teaching purposes — cafeteria, teachers' lounge, gym, maintenance, etc., must be more effectively used.

spaces outside the school building

Alfred Roth's study of schools in Switzerland indicated an average of 400 square feet of gross area allocated for each pupil in primary schools.[4] (Gross area is defined, in this instance, as the total size of the site on which the school is located.) English standards are of the same order although there are some outstanding examples of schools with much higher ratios. North American expert Ernest J. Kump has recommended 1,722 square feet per student with the proviso that the exterior space also serve the local neighborhood as a park.

Investigating the situation in the region of Montreal, one finds standards significantly below those found in Europe and only a fraction of those recommended for North America. We are faced with a situation in which the importance of non-academic activities, especially physical training, games and sports is well down the list of educational priorities. This is manifested by the relatively small amount of space provided in schools here for such activities.

This lack is pinpointed by a study of the gross amount of space allocated per student for specific schools. Obviously, inner city schools have the least number of square feet per student. A study of five primary schools of the Montreal Catholic School Commission in the eastern sector of the city of Montreal reveals an average provision of 105 square feet per student. Individual examples range as low as 45.5 square feet per student up to a maximum of 140 square feet per student. In Westmount, a wealthy suburb of Montreal, the area provided for Roslyn, a primary school, is 130 square feet per student. Here the figure has been reduced by a considerable expansion of the school since its original construction without proportionally expanding its site. This is a common occurrence in the case of urban schools since site expansion would normally be prevented by existing streets and buildings. In terms of gross area per student, suburban students are better off than their urban counterparts. However, the area provided still falls well below the standards prevalent in Europe.

A study of three recently constructed primary schools in Beaconsfield,[5] a suburban community west of Montreal, reveals an average of 291 square feet provided per student. Two of the schools are on similarly shaped sites and have been "landscaped" by the same authority. The sites are flat and an area at the rear of the schools of approximately sixty feet in width has been asphalted. The remainder of the site is grass

with one or two trees, and the entire area is surrounded by a chain link fence. Our study has yet to examine, in detail, the children's use of the site, but preliminary observations at one school indicate that the area showing the most use is where some large trees provide shade (here the grass has been worn away) and the land itself is other than flat.

If the "school," therefore, is to include, in addition to classrooms, other opportunities for learning, it will not only have to provide gardens, play areas, games areas and exterior teaching spaces, but will also have to ensure that all these spaces are better integrated.

planning the school grounds

The design of the total school environment is a challenge which must be met by the designer and the educator alike. The planning of the exterior spaces must be carefully integrated with the design and function of interior spaces and must be undertaken from the outset rather than being considered only after the building has been completed. By complementing the built form with landscaping — earth mounds, free-standing walls, trees and other forms of planting — exterior spaces may be shaped to provide for specific activities. The spaces surrounding the school can fulfill a more useful purpose other than merely serving as waiting rooms, as they tend to do now.

With imaginative planning, exterior spaces can, for at least four to five months of the school year, be used as *teaching spaces.* This requires a partially covered, paved area with proper orientation, direct connection with interior teaching spaces and the possibility of visual surveillance of the students by the teacher. The only areas presently designed in such a manner are those connected to the kindergartens. However, if the usual trend for innovation in education to be initiated at the lower levels and gradually extend to the higher levels prevails, we may perhaps anticipate the eventual development of such exterior spaces in elementary and secondary schools.

Alfred Roth emphasizes the physiological and regenerative functions of the school yard,[6] as well as its usefulness as a teaching space. Educators are encouraged to allow the child to spend as much time as possible outdoors owing to the fundamental benefit derived by the child in physical, mental and moral growth. "Good landscaping and the appropriate distribution of green spaces will give the child what it needs: an harmonious equilibrium between organized and free physical and intellectual activities."[7]

Given the accepted importance of play in the physical, intellectual and emotional development of children, surprisingly little is known of the patterns of play related to the school environment. And the little that is known has not yet been applied in the design of exterior learning spaces. This is most evident in urban schools where the norm is a single, asphalted, prison-like yard. In primary schools, children from five to twelve years old are expected to play in the same space. The only recognition of specific activities is expressed in the painting by the authorities of white lines delineating boundaries for individual games.

In contrast to other ancillary exterior facilities, the recreation area must be separated from the teaching areas and include facilities for games as well as space for quiet informal interaction between students. Planned provision of the latter is completely lacking in today's schools. Emphasis, if any, has been placed on the provision of areas for the more vigorous activities of the older children. Bearing in mind the users and their usual activities, the recreation space must be subdivided to allow the children of different ages and needs to co-exist easily.

Spaces should be planned to allow their use by some of the students while others remain in the formal interior teaching spaces. This requires noise control, either in the form of physical barriers or separation of the activities by sufficient distances. Visual separation is also important as children working inside could be distracted by those playing outside. Coupling this constraint with the desirability of good visual contact with some aspects of the exterior, the designer is presented with a difficult but not unsolvable problem.

The ideal solution can be envisaged as a single-storey school with each interior learning space opening out to a partially-covered, paved, sun-filled, wind-protected exterior teaching and learning space. Beyond this "learning court," and both visually and acoustically separated from it, would be a recreation area designed to include both passive and vigorous activities.

new directions in school architecture

New directions in educational processes have, as has been mentioned above, induced the architect to respond with new arrangements and building forms. Anticipating further developments in educational technology and consequent changes in spatial demands, the architect must approach the design of

physical aspects of the educational environment in a more comprehensive manner. The concept of a truly flexible school requires a shift in the traditional role of the designer. Professor Theodore Larsen, Director of the University of Michigan's School Environments Research Project states that:

> The architect now comes in at the very inception of the school curriculum, participates in setting up the original design programs, creates the original plant, then continues on as a design consultant.[8]

By supervising and designing for change, the architect remains involved with the school on a continuing basis. When the architect is not involved in this way, it can lead to situations such as that which occurred in California involving the systems developed by School Construction System Development. John Boice, in a study evaluating two SCSD schools, discovered that a majority of the teachers were not even aware of the flexibility of the system, and of those who were aware of it, few knew how to effect the changes which were possible.[9]

Not only will the continuing involvement of the architect help avoid such occurrences, but the architect, himself, through a continuing association with teachers and students, will be better prepared to design future schools.

obsolescence and renovation

The highly diverse nature of education, characterized by rapid change, necessitates the consideration of the school as a building always in a transitional state. Only when it becomes structurally obsolete and must be demolished should its usefulness finally be considered to be at an end.

The present problem faced by most school commissions, therefore, is not the construction of new schools, but the renovation of existing schools in response to new educational demands. These renovations have, in some instances, proved more successful than one might suspect. The handicap of adapting an existing structural system to new uses, together with, in most cases, the problem of a serious lack of ground area, can be countered by the fact that the alterations are in *direct* response to the needs of a group of teachers and students presently using the building.

Contrasted with the usual situation in which the decisions are made by the school authorities, the participation of the users of the facility has obvious advantages. These renovations are characterized by the disappearance of the traditional classroom and the creation of large open spaces. Where

acoustic or visual separation is desirable, new systems of partitioning are introduced.

A more difficult aspect of renovation is incorporating the concept of the integration of the building and the site at the planning stage. Many of our existing schools are designed in such a way as to make contact with exterior spaces difficult. Most are built on sites where expansion to provide an acceptable level of gross area per student would be prohibitive in terms of cost and neighborhood disruption. However, these problems must be overcome as the provision of improved, comprehensively designed and maintained facilities is essential to support evolving developments in education.

Recognizing that the arrangement of learning spaces controls the movement of both students and teachers in the school and hence their personal contacts, the designer, by easing the rigidity imposed by the traditional egg-crate plan, can create freedom of movement which would result in beneficial changes to the learning environment. Increased visibility of various activities and additional opportunities for interpersonal contacts should lead to increased participation, interest and involvement on the part of both students and teachers.

references

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