INTENSIVE UTILISATION OF PRIMARY SCHOOL SPACES

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Shortage of school premises for the existing population, a continuously increasing demand for more spaces to cope with the unprecedented increase in population, coupled with lack of resources to provide the same is, in a nutshell, the problem faced by any developing country. Millions of school-going children are required to be housed in school buildings to meet their urge for education. This naturally requires a very large number of school buildings. It is therefore necessary that every possible economy be achieved in the design of new schools.

There are many ways of tackling this problem: more places can be provided by reducing the gross covered area per student; by lowering the cost of construction; by arranging for the building to be used in shifts. Another way is to ensure that no underused spaces are provided in the design of future school buildings.

With the above objective in view, a study on the use-efficiency of school spaces was undertaken at the Central Building Research Institute, Roorkee, India, to examine how economy in spaces could be effected through the continuous use during the school day of spaces in school buildings and on the school site.

Use-efficiency

There are several ways of estimating the relative economy of a building:

(a) by comparison between the gross area available for teaching and the remaining area of the school;

(b) by comparison of a number of schools in respect of areas of different spaces;

(c) by comparison of covered area per pupil considering various functions;

(d) by comparison of cost per student place.

None of the above mentioned methods indicates the degree to which the spaces are used. It was therefore necessary to study the teaching time-table in relation to the plan of the building. From this it was possible to express the actual use of each space in relation to the length of the school day during which the building was in use. The use-efficiency was defined as the ratio between actual and ideal use per square feet per hour. The actual use was area of space used multiplied by time, and the ideal use was total area of space multiplied by total school time.

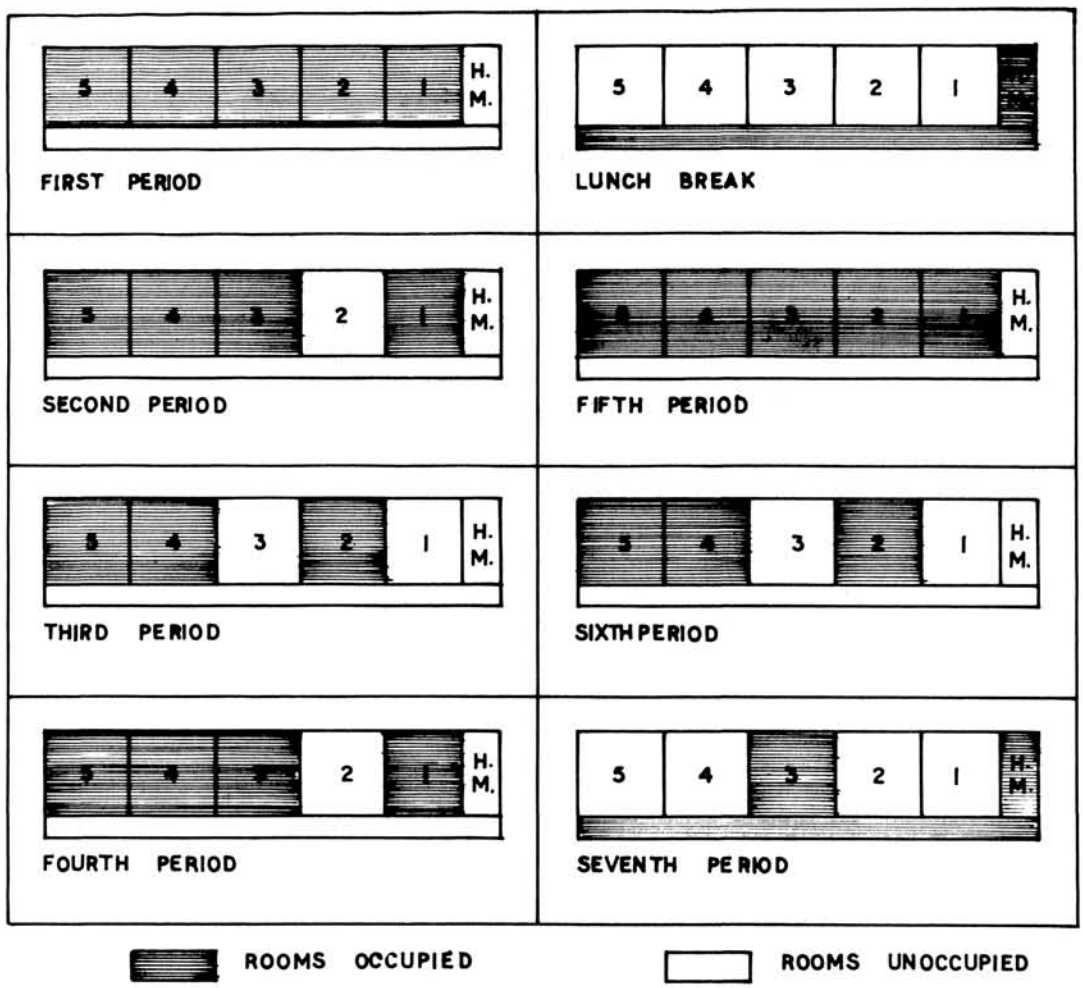

Fig.1. School building plan for 5-classroom school related to the time-table

TEACHING PERIODS

Class	Inside periods	Outside periods (including 1 lunch period)
I	4	4
II	4	4
III	5	3
IV	6	2
V	6	2

Area of each classroom 7.32 x 6.1 M = 44.55 M_2^2
Area of verandah 39.62 x 1.52M = 60.22 M_2^2
Area of H.M. room 3.05 x 6.1 M = 18.60 M^2

USE-EFFICIENCY OF SPACES

Class I: Actual use 44.55 M_2^2 used for 2.7 hours = 120.40M_2^2 hours
Ideal use 44.55 M^2 for 5.25 hours= 234.11M^2 hours

$$\text{Use-efficiency} = \frac{120.40}{234.11}$$

U.E. Class I = 0.51
" " Class II = 0.51
" " Class III = 0.63
" " Class IV = 0.76

U.E. Class V = 0.76
" " Verandah = 0.25
" " H.M. room = 0.25
Use-efficiency of the school = 0.52

A typical school building plan of five classrooms (Fig. 1) was related to the time-table being followed in local primary schools. The time-table in terms of outdoor and indoor periods is also indicated in the figure. The $5\frac{1}{2}$ hours (10.00 a.m. to 3.15 p.m.) teaching day with eight periods of forty minutes each (including one lunch period) was the general pattern. The study revealed that the use-efficiency of the school building was 52 per cent and the occupancy of the verandah and the headmaster's room was as low as 25 per cent. The use-efficiency of classes ranged from 51 to 76 per cent.

Increased use-efficiency

To achieve economy in buildings, increased use-efficiency was attained by eliminating the less used spaces, and by a rational application of teaching periods in the school plan. By eliminating the verandah and the headmaster's room, use-efficiency of the school building increased to 63 per cent and an economy of 25 per cent in space was obtained. These spaces may be desirable features of schools but since their elimination does not strictly affect education, they may be left out until more funds for construction are made available.

In an effort to achieve optimum use of classroom spaces, the time-table was analysed and rearranged. The rational application of the time-table to the school building plan (Fig. 2) indicated that a primary school could very well function with three classrooms only. It increased use-efficiency to 85 per cent and also economised 40 per cent in the overall teaching-space requirements.

Study of educational problems

Due to increased use-efficiency and the reduction of overall teaching space, it was considered necessary to ensure that the standard of instruction should not suffer on account of this economy. With this in view, the study of educational efficiency was undertaken in collaboration with education officials of the Education Department of the State of Uttar Pradesh. During the first stage of the study an effort was made to identify the subjects which could easily be taught in open spaces on the basis of actual performance of instructional practices. It was observed that the activity programme, such as physical culture (including games for lower classes), basic crafts, and the teaching of multiplication tables to lower classes (through clay balls, sticks and other activity methods), could easily be taught in open or in sheltered spaces.

With the existing pattern of instruction, grades I and II are required to attend school at 10.00 a.m. and continue up to the closure of school. It is a long and strenuous period for a child of six or seven years of age. In the new time-table, grades I and II were let off in the last period.

Having identified the subjects which could be taught in the open, and after studying carefully the educational specifications, a time-table was evolved to suit the new special provision. The time-table was prepared so that three classes were in the buildings and two outside, depending upon the subjects being taught.

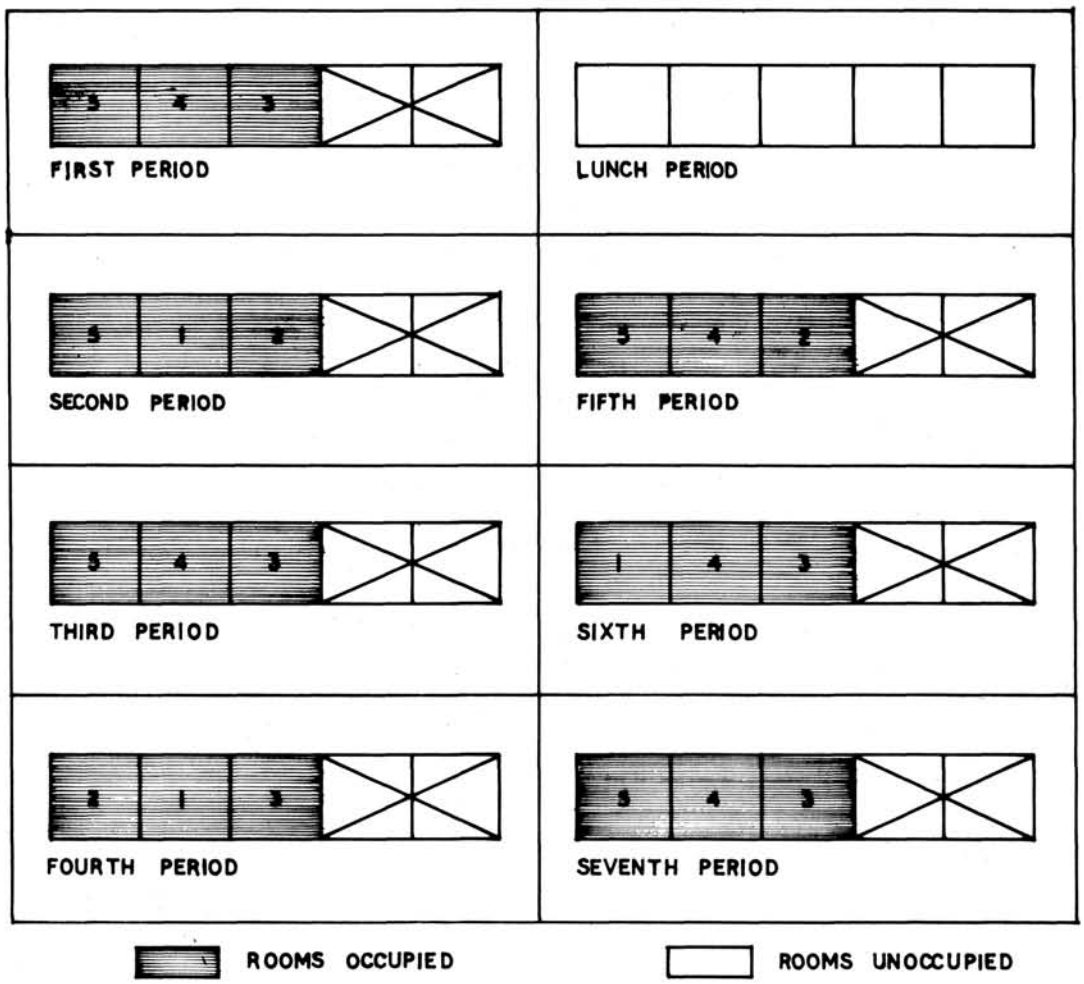

Fig.2. Rational application of time-table to the school building

TEACHING PERIODS

Class	Inside periods	Outside periods (including 1 lunch period)
I	3	4
II	3	4
III	5	3
IV	5	3
V	5	3

USE-EFFICIENCY

Actual use 133.77 M^2 used for 4.6 hours = 615.34 M^2 hours
Ideal use 133.77 M^2 used for 5.25 hours = 702.3 M^2 hours

$$\text{Use-efficiency} = \frac{615.34}{702.3}$$

$$= 0.85$$

Actual trials in schools

Before any final conclusions could be drawn from the above study it was considered necessary to study the implications by actual observation. This was done in forty schools in and around Roorkee, all having the same basic education curriculum. The experiments were conducted on both rainy and clear days.

Experiments on rainy days

Since outdoor teaching was not possible, it became necessary to accommodate all students in the building itself. It was decided, under such conditions, to combine two classes, keeping in view their teaching standards. Combinations of grade I with grade II were always troublesome because of the greater numbers of children in each class and also because of their childish habits. Combinations of grade IV and V and III and IV worked tolerably well. Obviously, the normal time-table was suspended during these days of class combination and certain work was undertaken which could sustain the interest of both the classes. For example, in language periods recitation and composition could be taught easily. In arithmetic periods recapitulation of multiplication tables and mental arithmetic was successfully undertaken. In social study periods, simple stories were narrated and the combined classes answered questions on these.

It was felt to be a poor compensation for the normal teaching work but, since the number of such days is very small against the economy in the huge amount to be spent on constructing school buildings, it was felt that the system could be made workable. The use-efficiency of the spaces was found to be 85 per cent.

Experiments on normal days

Efforts were also made to achieve 100 per cent use-efficiency of spaces during school days by staggering the mid-day lunch-time but this did not find favour with the teachers. The time-table was therefore finally revised with the following considerations;

(a) the mid-day lunch break to be the same for all classes;

(b) three classes to be inside the building while two classes for outdoor teaching should have the same subject, such as gardening, physical training, crafts work or games;

(c) movement of classes to be kept to a minimum;

(d) no space was to remain unused.

Observations

(a) Some space was required for keeping the satchels of students while changing classes. To solve this problem, the provision of shelves or pegs was recommended. An economical solution was found by providing matting outside in the open, marked with numbers, where students could keep their satchels. This worked fairly well.

(b) While the sun was high, outdoor teaching activities were uncomfortable. A need was felt for some sheltered spaces for outdoor activities during rainy or hot weather.

(c) Outdoor lessons for activity and creative work necessitated physical movement from the building to the site and from the site back to the building. A majority of teachers observed that students were refreshed and invigorated by the change of teaching location.

(d) On an average, five minutes were spent in changing classes. This made teachers unhappy. At the initial stages indiscipline amongst students was noticed while changing the classes. Later, students were guided to move in single file. After this systematic movement had been practised, room changes were performed in two minutes.

(e) A great responsibility was laid on the teachers to plan their lessons so as to finish within the prescribed time. Class movement from building to site and site to building and improved planning of the lessons by the teachers helped students to take more interest in their lessons.

Findings of the study

(a) Three classrooms with a sheltered space, instead of five classrooms, are adequate for a school of five classes.

(b) Optimum use of spaces is attained with 85 per cent use-efficiency.

(c) Students undertake more outdoor activities which, though included in the curriculum, are often neglected.

(d) Standard of instruction had improved.

(e) Students took more interest in their lessons.

As a result of these findings, and to cater for climatic requirements, school plans were developed. The observations indicated the need for a sheltered space in addition to three classrooms. This space is located at a point where, in combination with other classrooms, it can serve as a large area for combined activity. Since the doors of the classrooms open on to it, the need for a verandah for circulation is eliminated. A number of prototypes of such schools have been constructed in different parts of India and their performance has been evaluated with encouraging results.

Acknowledgement

This study forms part of the normal research work of this Institute, and is published with the permission of the Director, Central Building Research Institute, Roorkee, India.