

A study on spatial parameters of Indian classrooms

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ABSTRACT

The spatial adequacy inside the classroom is an important determinant of learner's comfort possibly affecting his work performance and mental efficiency, thereby affecting the workability of this workplace which is of considerable importance nowadays. The present study aimed at measuring spatial dimensions and allowances inside selected classrooms and to evaluate the classroom furniture in terms of physical appearance. A total sample of 20 classrooms (Two classrooms from each of the 10 colleges) were selected for taking spatial measurements of existing furniture and 320 users of this furniture were also selected for administering the subjective response scale in order to evaluate the classroom furniture in terms of physical appearance. The height of classrooms was appropriate but all other dimensions were far below the standards. The area and space available per student was inadequate and the design, colour and texture of the existing classroom furniture were evaluated as average by the respondents.

Key Words : Spatial parameters, Indian classrooms, Colour

INTRODUCTION

The issue of quality of working life will become the major concern of people in India in the coming few decades because of fast growing intellectual sector. The task of understanding the multiple aspects of learning environment and attempting to make these more effective is a complex undertaking. Learning is no longer considered merely an accumulation of knowledge but rather, the understanding or ability to construct knowledge in meaningful ways for a particular purpose or solution to a well-defined problem. Class room is a place where students spend most of their time. As they have to spend considerable amount of time on studies, provision for good study facilities becomes essential. The spatial adequacy of the classroom is an important determinant of learner's comfort possibly affecting his work performance and mental efficiency. Besides, a class-room has to facilitate learning and increase the work efficiency of the students through providing a comfortable and stress-free working environment suitable for intellectual activities. However, till now little interest has been shown in the largest working place, *i.e.*, the class-room. The present study, therefore, is an attempt to study the spatial parameters of Indian classrooms with the following objectives:

1. To measure spatial dimensions of selected classrooms.
2. To measure space allowances present inside the selected classrooms.
3. To evaluate the classroom furniture subjectively in terms of physical appearance

METHODOLOGY

Location of work :

The study was conducted in Ludhiana city. The local selection of the sample was purposive because of the workability and kind of measurements required.

Selection of the sample:

A total sample of 10 colleges was randomly selected for this study. Two classrooms from each college, making a total of 20 classrooms were selected for recording the spatial measurements of classrooms. In addition, 16 users from each classroom were selected making a total of 320 users on whom the subjective response scale was administered to evaluate the classroom furniture in terms of physical appearance.

Construction of research tools:

For classroom survey, a record sheet was constructed which recorded spatial dimensions of all the selected classrooms but for subjective responses, a separate questionnaire was formulated and administered on 320 respondents for the subjective evaluation of classroom furniture inside selected classrooms in terms of its physical appearance as liked by the female student subjects.

Data analysis:

The data was analyzed using various statistical tools like averages, frequencies, percentages and standard deviation.

RESULTS AND DISCUSSION

Dimensions of selected classrooms:

Dimensions of the selected classrooms were studied and measured in order to know the adequacy of space available to the students. These measurements included the length of the classrooms, width of the classrooms, height of the classroom, the area and volume of the classrooms and the area available per student and the volume available per student. These results have been presented in the Table 1 and are discussed below:

Length (m):

Table 1 reveals that half of the classrooms were having length of 6-8 m while 25 per cent had (8 m-10 m) length and rest 25 per cent had 10-12 m length. The mean length of the classrooms was 8.50 ± 1.70 m. According to the Central Building Research Institute (1999), the recommended length for a classroom having 40 students with furniture is 7.32 m. In case of the surveyed classrooms where the average student population per classroom was 54 and the length of the classroom should be well above this value. In case of 25 per cent of the classrooms, the length was well above the recommended value *i.e.* it was in the range of 10-12 m. But, in 75 per cent of the classrooms it was below the recommended dimension. Thus, it can be concluded that the length of the classrooms being surveyed was falling short of standard values.

Width (m):

Table 1 also reveals that majority, *i.e.* 75 per cent of the classrooms were 5-7 m wide while 20 per cent of the classrooms had 7-9 m width and the rest 5 per cent were 9-11 m wide. The mean width of the classrooms was 6.60 ± 1.14 m. The recommended width of the classroom should be 6.10 m according to the Central Building Research Institute (1999) for a classroom having strength of 40 students. This means that the width of the classrooms for the surveyed classrooms (54 students) should be well

above 6.10 m and in 25 per cent of the classrooms it was from 7m to 11m. Thus, it is indicated that the width of the surveyed classrooms was quite close to these standards.

Height (m):

Table 1 also shows that 75 per cent of the classrooms were 3-4 m high while 20 per cent of them were 2-3 m high and 5 per cent of them were 4-5 m high. The mean height of the classrooms was 3.35 ±0.59 m. But in case of 20 per cent of the classrooms, it was below 3.35 m and was from 2 m to 3 m.

Area (m²):

The perusal of Table 1 reveals that majority of the classrooms (80 %) had an area of 55-60 sq m. Ten per cent had an area of 50-55 sq m and the rest 10 per cent had an area of 45-50 sq m. The Central Building Research Institute (1999) recommends 61.05 sq m area as standard for the classrooms having 40 students. Thus, for the classrooms having 54 students on an average, the average area of the surveyed classrooms which was 56.00±2.29 sq m was far below the standard and needs improvement.

Table 1 : Spatial dimensions of selected classrooms (n= 20)				
Dimensions	Number	Per cent	Mean	SD
Length (m)				
6-8	10	50.00		
8-10	5	25.00	8.50	1.70
10-12	5	25.00		
Width (m)				
5-7	15	75.00		
7-9	4	20.00	6.60	1.14
9-11	1	5.00		
Height (m)				
2-3	4	20.00		
3-4	15	75.00	3.35	0.59
4-5	1	5.00		
Area (m²)				
45-50	2	10.00		
50-55	2	10.00	56.00	2.29
55-60	16	80.00		
Volume (m³)				
181-184	1	5.00		
184-187	3	15.00	187.75	2.94
187-190	16	80.00		
Area per student (m²)				
0-1	10	50.00		
1-2	9	45.00	1.05	0.49
2-3	1	5.00		
Volume per student (m3)				
0-3.5	10	50.00		
3.5-7	9	45.00	3.35	1.83
7-10.5	1	5.00		

Volume (m^3):

Volume represents the total space available inside the classroom. Volume of the classrooms was measured in the survey because it not only indicates the space available but also the amount of air available inside the classrooms. Table 1 shows that majority of the class-rooms (80 %) had a volume of (187-190) m^3 . The rest 15 per cent had a volume of 184-187 m^3 and only 5 per cent had a volume of 181-184 m^3 . The Central Building Research Institute of India recommends a volume of 204.52 m^3 for the classroom having 40 students. Thus, for an average number of 54 students, the volume should be well above this value. The mean volume of the classrooms surveyed was $187.75 \pm 2.94 m^3$ which was not appropriate and acceptable according to the standards and it needs to be considered for improvement.

Area per student (m^2):

Table 1 reveals that in 50 per cent of the classrooms, the average area available per student was between 0-1 sq m. 45 per cent of the classrooms had 1-2 m^2 of area available to the each student and only 5 per cent of the classrooms had 2-3 m^2 area available per student. The mean area available per student was 1.05 ± 0.49 sq m. The Central Building Research Institute recommends that 1.11 sq m area per student should be available. This indicates that the surveyed classrooms had less area available for each student in majority of the classrooms.

Volume per student (m^3):

Table 1 shows that in 50 per cent of the classrooms, space available per student was between 0-3.5 cubic meters while in 45 per cent of the classrooms it was between 3.5-7 cubic meters and in the rest 5 per cent of the classrooms it was between 7-10.5 cubic meters. The mean space available per student was 3.35 ± 1.83 cubic meters. According to the guidelines laid down by the Central Building Research Institute (1999), the space available per student should be at least 3.72 cubic meters. This indicates that sufficient space was not provided to each student in the surveyed classrooms.

Thus it is evident from the Table 1 that the length of the surveyed classrooms was falling short of the standard values. Besides, the width of these classrooms was also not appropriate according to the standards. In case of height, 20 per cent of the classrooms were below 3.35 m which is the recommended average and majority (80 %) were according to the recommended dimension. In case of area of the classrooms, it can be noted that it was far below the standards and same is the case with the volume of the classrooms. Again, in the surveyed classrooms, area available per student was less and the space per student was also not sufficient. A lot of space was being wasted especially the back space was mostly wasted and students were concentrated in the front rows because of the inappropriate size and position of the blackboard and instructor table. Thus, some improvement has to be made to increase the standard of classrooms in order to provide adequate space for effective teaching and learning experience.

Space allowances inside the selected classrooms:

The space allowances present inside the classrooms were also studied which included working width, clearance space and passage width and length provided inside the classrooms. These have been explained in the following section:

Working width (cm):

Table 2 shows the space allowances inside the classrooms. Table 2 reveals that in case of 85 per cent of the classrooms the working width was in the range of 35-49 cm, 5 per cent classrooms had 49-63 cm as the working width and 10 per cent classrooms had 21-35 cm as the working width. The average working width was 41.30 ± 5.52 cm. A working width of 70-74 cm for females is recommended by Grandjean (1988). This indicates that very less working space was available for students in the

Table 2: Space allowances inside selected classrooms (n=20)				
Space allowances	Number	Per cent	Mean	SD
Working width (cm)				
21-35	2	10.00		
35-49	17	85.00	41.30	5.52
49-63	1	5.00		
Clearance space (cm)				
17-31	18	90.00		
31-45	1	5.00	26.10	6.85
45-59	1	5.00		
Passage length (cm)				
200-420	4	20.00		
420-640	14	70.00	508.00	121.55
640-860	2	10.00		
Passage width (cm)				
54-60	4	20.00		
60-66	15	75.00	62.10	2.94
66-72	1	5.00		

classrooms under study. The average working width was less than the recommended value and none of the classroom had width in this range.

Clearance space (cm):

Ninety per cent of the classrooms had very less clearance space *i.e.* 17-31 cm whereas in rest of the two classrooms the students had 31-45 cm and 45-59 cm as the clearance space available respectively. The average clearance space available for the students was 26.10±6.85 cm.

Passage length (cm):

The average passage length between the two rows inside the classrooms was 508±121.55 cm. In case of 70 per cent of the classrooms, the passage length was 420-640 cm while in only 10 per cent of the classrooms it was 640-680 cm and in the rest 20 per cent of the classrooms the passage length was 200-420 cm.

Passage width (cm):

It can be further clearly seen from Table 2 that average width of the passages between two rows inside the classrooms was 62.10±2.94 cm. In case of 75 per cent of the classrooms it was 60-66 cm, 20 per cent had 54-60 cm as the passage width while 5 per cent classrooms had 66-72 cm as the passage width. The recommended measurement for this dimension is 92 cm for women as given by Grandjean in 1988. None of the classrooms had passage width in this range. This indicates that the passage width in the surveyed classrooms was not up to the standards and it was far less than the appropriate.

Design:

The subjective evaluation regarding physical appearance of existing classroom furniture shows that 5 per cent respondents perceived the design to be very good, 55 perceived it to be good and 40 per cent perceived it to be fair for existing classroom. The mean score for this parameter was calculated to be 0.55 which shows that liking for the design of existing classroom furniture was average (50% to

Ranking	Parameter		
	Design	Colour	Texture
Very good	16 (5)	16 (55)	32(40)
Good	176(55)	144(45)	192(60)
Fair	128(40)	160(50)	96(30)
Mean score	0.55 (55) **	0.52 (52) **	0.60 (60) **

Figures in parentheses indicate percentages.

Very good - 3, Good – 2, Fair – 1

* Below Average (Less than 50 %)

** Average (50% to 60%)

*** Above Average (More than 60%)

60%).

Colour:

Again, Table 3 depicts that colour of the selected classroom furniture was perceived by respondents as Very good (5%), Good (45%) and Fair (50%). The mean score for this parameter was found out to be 0.52 which again indicates an average (50% to 60%) liking for the existing furniture as far as its colour was concerned.

Texture/Finish:

The Table 3 further reveals that texture/finish of the selected classroom furniture was perceived by respondents as Very good (10%), Good (60%) and Fair (30%) The mean score for this parameter was calculated to be 0.60 which reveals an average (50% to 60%) liking for the texture/finish of the selected classroom furniture.

Conclusion:

The height of the classrooms was appropriate but all other dimensions were far below the standards. The area and space available per student was inadequate and a lot of space was wasted due to improper layout of the furniture. Very less working space was available for the students in the classrooms. Ninety per cent had very less clearance space. The average passage length between two rows in the classrooms was 508 ± 121.55 cm. The passage width was also not sufficient. The design, colour and texture of the existing classroom furniture was evaluated as average by the selected respondents.

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