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Assessment of comfort among students in special schools of Dharwad and Hubli

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Abstract

Special children need a good classroom design to ensure proper learning in the classroom environment. Proper interior conditions are required to make students adapt to the classroom. Lighting is one of the most important physical environment considerations in classroom design. Students in special schools in Hubli and Dharwad were surveyed on their perception of classroom conditions. Majority i.e., 46 per cent of students considered the space in their classrooms to be low. Majority of the students considered their classroom size as moderate even though the size was low when compared with BIS standards. Intensity of light was also considered enough even though when the availability is comparatively very low. Opinion of students and the collected data regarding space availability in the classroom was similar. The results also show a great association between existing classroom interiors and opinion of students on their comfort in the classrooms. The overall study states that following standards while designing classroom and considering the opinion of students is crucial to help students adapt to their classroom and comfortably perform their assigned tasks.

Keywords: Perception, intensity, comfort, illumination, availability

Introduction

Special education is the practice of educating students in a way that accommodates their individual differences, disabilities, and special needs. The schools that provide special education are termed as special schools. Special children often need a good classroom design to ensure proper learning in the classroom environment. Proper interior conditions are required to make them adapt to the classroom and perform required tasks. Elements in interior design and decoration include various interior concepts such as color, lighting, wall finishes, floor finishes and ceiling (Premavathy and Parveen, 2012) [1]. Part of the interiors is physical interiors which include size of the classroom, walls, ceiling, flooring and openings in the classroom. The physical interiors regulate the classroom conditions such as temperature, intensity of light and noise which are very important in making the children comfortable.

One of the important physical environment considerations in classroom design is lighting which has long been overlooked by administrators as a secondary consideration in classroom design in terms of budget during the planning process. Moshood *et al.* (2014) evaluated indoor environmental quality conditions in elementary school classrooms in the United Arab Emirates [2]. Inadequate lighting in the classrooms may create discomfort making difficult to complete work (Winterbottom and Wilkins, 2009) [3]. According to a study in Italy (De Giuli *et al.* 2015) [4], Indoor environmental conditions have a great impact on children's comfort.

With many research studies now proving that both natural daylight and appropriate artificial illumination are critical to the quality of student performance, lighting should be carefully addressed in new construction and modernization projects of classroom design. Hence, the available illumination on the student's workstation should be considered (Meenakshi., 2015) [5]. Good classroom arrangement inspires, and encourages children to easily interact with each other and develop various skills including language, and social behavior (Samuel., 2017) [6]. Chiara and Callender (1990) suggested the seats should be arranged so that each student has a clear view of the chalkboard and a sufficiently well-lit writing surface [7]. Nuria *et al.* (2017) studied students' affective responses to generate design criteria for classrooms [8]. Miranda *et al.* (2022) studied effect of ventilation conditions on thermal comfort by considering the satisfaction among students. The current study involves understanding the comfort of students in relation with their existing classroom conditions [9].

Materials and Methods

The study was conducted in Hubli and Dharwad cities of Dharwad district during 2021-22. The selection of the sample was carried out with the help of the purposive sampling method. A total of 120 students were selected for the study from special schools located in Dharwad and Hubli. The schools were visited to observe and to collect the data on present classroom conditions. In order to assess the perception of students a self-structured interview schedule was employed. The interview schedule was also used to collect primary data from the selected classrooms. The data included details of selected classrooms *i.e.*, physical interiors, openings in the classroom and intensity of light. The data was analysed using suitable statistical methods.

Results and Discussion

Fig. 1 presents the perception of students on classroom size of selected classrooms in different schools. Number of students who considered classroom size of school 1 as small was 3, medium was 23 and big as 5 respectively. Number of students who considered classroom size of school 2 as small was 13, medium was 15 and big as 2 respectively. Number of students who considered classroom size of school 3 as small was 20, medium was 9 and big as 2 respectively. Number of students who considered classroom size of school 4 as small was 10, medium was 16 and big was 4 respectively. The area of the classrooms varied from 9.70 sq.m to 17.99 sq.m., with no school fulfilling the Bureau of Indian Standards (BIS) recommendation (50. 37sq.m) [10]. However, majority of the selected students rated their existing classroom as medium size. Savanur *et al*. (2004) also found in their study that area of classrooms varied and its mean area was 34.04 sq.m [11].

Fig. 2 shows the perception of students on space availability of selected classrooms in different schools. Classroom of school 1 was considered having no space by 5 members, little space availability by 21 members and good space availability by 5 members. Classroom of school 2 was considered having no space by 10 members, little space availability by 15 members and good space availability by 5 members. Classroom of school 3 was considered having no space by 2 members, little space availability by 7 members and good space availability by 22 members. Classroom of school 4 was considered having no space by 3 members, little space availability by 15 members and good space availability by 12 members.

Space around each student's desk and table and around the seating was found in the range of 5"-7" which was very low in order to move around in the classroom. Majority of the students considered having little space availability in their classrooms which justifies the results of measured space in the classrooms. Patel *et al.* (2022) suggested accommodating sensory requirements which effect students' attention, behavior, and engagement with peers and course material in class [12].

Fig. 3 shows the perception of students on lighting on desks of selected classrooms in different schools. Shabha (2006) revealed that bright colors, echoing, background noise, and other elements, have a negative impact on children's behaviour [13]. Classroom of school 1 was considered having low lighting availability on desk by 4 members, moderate lighting by 21 members and high lighting by 6 members. Classroom of school 2 was considered having low lighting availability on desk by 11 members, moderate lighting by 18 members and high lighting by 1 member. Classroom of school 3 was considered having low lighting availability on desk by 7 members, moderate lighting by 2 members and high lighting by 22 members. Classroom of school 4 was considered having low lighting availability on desk by 13 members, moderate lighting by 13 members and high lighting by 4 members.

Lighting in the classrooms of all the selected classrooms was found to be lower than the standards. However, majority of the students considered having moderate lighting conditions in their classroom interiors. Sakya *et al.* (2017) in his study concluded that autistic sensitivity is affected by interior design aspects [14]. A study in Mexico showed that the lighting and color of treatment rooms have a significant impact on children's health (Monzavi, 2019) [15].

Details of physical interiors is shown in Table 1. The selected classrooms were located in first floor for school 1, school 4, second floor for school 2 and ground floor for school 3. Classroom size of selected classrooms is 12' x 10' x 10' for school 1, 15'5" x 12'5" x 9'6" for school 2, 11' x 9'9" x 10' for school 3 and 11' x 9'5" x 9'8" for school 4. A Study in Ghaziabad, India revealed that detrimental variations in environmental stressors had a significant impact on students' academic performance (Jha *et al.*, 2010) [16]. Flooring material used for classrooms were marble for school 1, ceramic tiles for school 2, school 3 and tiles for school 4. Wall finish used for selected classrooms was white wash for school 1, school 2, school 4 and yellow distemper for school 3. Ceiling material used for all schools was RCC. The size of the classrooms of all the selected schools were lower than the Bureau of Indian Standards (BIS) recommendation (24'4"x23'x10') [10]. Similar findings were found in the research carried out by Meenakshi (2015) in Dharwad city where all the selected classrooms size was lower than the BIS recommendation [5].

The opening details of selected classrooms is shown in Table 2. Window percentage in floor area for selected classrooms is 10 per cent, 12.5 per cent, 8.3 per cent, 12.5 per cent for school 1, school 2, school 3 and school 4 respectively which is less than the standards. Sill height of the classrooms was 2'6", 3'2", 2'5", 2'8" for school 1, 2, 3 and 4 respectively. School 1 and school 3 had low sill height than the standards. School 2 and school 4 had sill height more than the standards. Type of window used for all schools was casement window. Similar findings were found in the research carried out by Meenakshi (2015) in Dharwad city where all the selected classrooms had window area lower than the BIS recommendation[5]. Sill height in all the selected classrooms were as per BIS recommendation [10]. When window percentage in floor area is more than 15 per cent, more amount of natural lighting can be drawn inside the classrooms which might decrease irritation or disturbance in the student's mood during activity. Tawfiq and Yang (2021) findings reveal crucial methods for first-grade students with impairments that alter classroom space and environment [17].

Table 3 presents intensity of light in the selected schools of Dharwad. For measuring Intensity of light, available daylight and combination of natural and artificial lighting

was considered. The data was collected during the month of June – July, 2022 and the general weather condition was found to be cloudy day with drizzling. Measurements were taken at three different time intervals of a day *viz*., morning (9 am), afternoon (12 noon) and evening (3 pm). The average level of illumination observed was 51 lux, 40 lux, 80 lux, 64 lux for school 1, school 2, school 3 and school 4 respectively. The mean illumination level is higher in the afternoon when compared with morning and evening. The level of illuminance was less than the BIS standard (150-200 lux) [10]. Similar findings were found in the research carried out by Ritu (2019) in Hisar city [18].

Table 4 shows the association between interiors of classroom and comfort of students in their classrooms. In all the schools, volume of the classroom is highly associated with their respective interiors (χ^2 = 21.98**). In case of illumination level, it is highly associated with interiors of selected classrooms (χ^2 = 32.04**). There was observed a high level of association between interiors of classroom and space availability (χ^2 = 27.31**), glare observed (χ^2 = 19.29**) respectively. The results show that there is a strong association between classroom interiors and opinion of students on their classroom comfort.

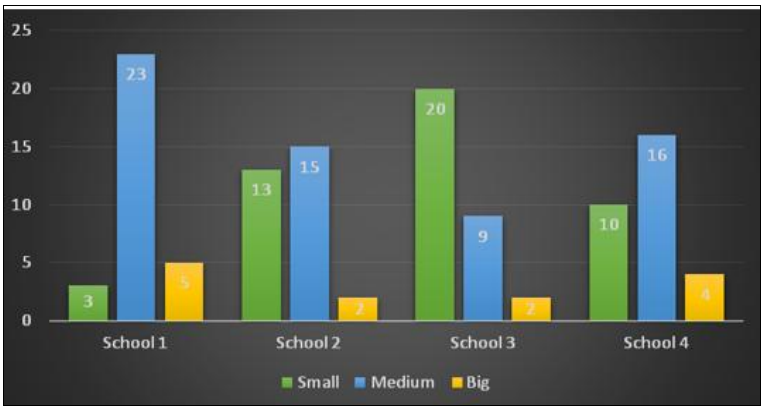

Fig 1: Opinion of students on Classroom size in selected classrooms

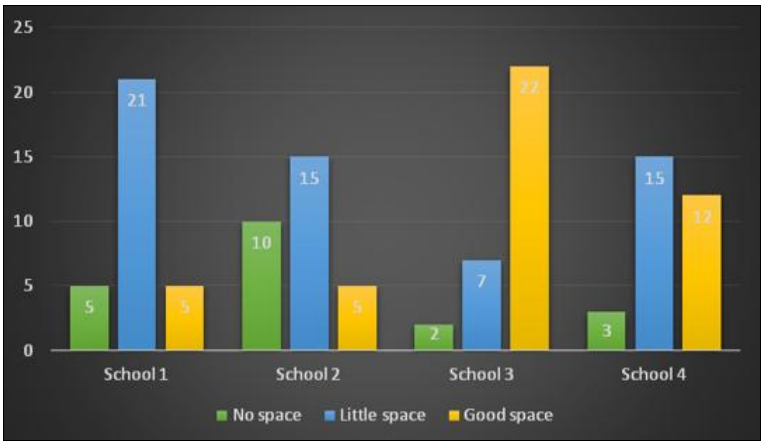

Fig 2: Opinion of students on space availability in selected classrooms

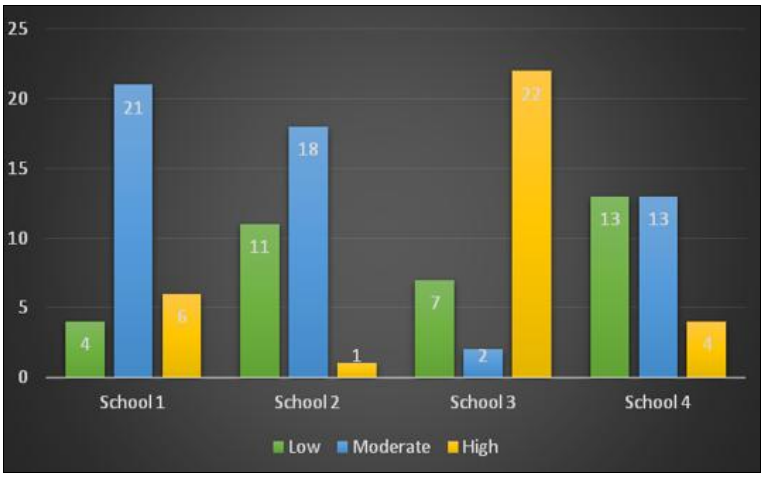

Fig 3: Opinion on lighting availability in selected classrooms

Table 1: Physical interiors in selected classrooms

Physical Interiors	Hubli		Dharwad	
	School 1	School 2	School 3	School 4
Classroom location	First floor	Second floor	Ground floor	First floor
Classroom Size-LXBXH (ft) (Area in sq.m)	12’ x 10’ x 10’ (11.17)	15’5” x 12’5” x 9’6” (17.99)	11’ x 9’9” x 10’ (10.11)	11’ x 9’5” x 9’8” (9.70)
Floor	Marble	Ceramic Tiles	Ceramic Tiles	Tiles
Wall Finish	Whitewash	Smooth and white wash	Yellow distemper	White wash
Ceiling	Conventional	Smooth ceiling	Plaster ceiling	Conventional

Table 2: Openings details of selected classrooms

Openings	Details	Hubli		Dharwad		BIS Recommendation (IS 4837: 1990)	Remarks
		School 1	School 2	School 3	School 4		
Window	Dimensions	4’ x 3’	3’8”x6’	2’10”x 3’2”	3’ x 4’	Not less than 15% of floor area	Majority are lower than the standard
	Area (sq. ft)	24	22.8	8.97	12		
	Percentage in floor area	10	12.5	8.3	12.5		
	Sil Height	2’6”	3’2”	2’5”	2’8”	Not more than 2’7” from floor level	As per BIS standard in majority of schools
	Material	Wood+Metal+Glass	Metal+Glass	Wood+Metal+Glass	Wood+Metal+Glass	-	-
	No. of windows	2	1	2	1		
	Type of window	Casement	Casement	Casement	Casement		
Door	Dimension (LXB)	6’10” x 3’	6’10” x 3’8"	6’7’x 2’10”	6’6” x 3’	-	-
	Material	Wood	Wood	Wood	Wood		
	No. of doors	1	1	1	1		
	Type of Door	Double	Single	Single	Double		

Table 3: Intensity of light in the selected classrooms

School	Intensity of light (Lux)							
	Natural				Both			
	9 AM	12 Noon	3 PM	Average	9 AM	12 Noon	3 PM	Average
School 1	21	26	19	22	46	52	48	50
	20	24	22	22	52	50	54	52
School 2	26	28	21	25	40	42	41	41
	22	27	26	25	36	39	42	39
School 3	34	38	33	35	76	84	80	80
	34	34	28	32	77	81	79	79
School 4	21	26	22	23	59	68	65	64
	20	28	27	25	60	67	65	64
Average	24.75	28.875	24.75	26.125	55.75	60.375	59.25	58.62

Table 4: Relation between interiors and comfort of students in different schools N=120

Elements		School 1 n=30	School 2 n=30	School 3 n=30	School 4 n=30	χ^2 value
Volume of the classroom	Low	1.43 (0.62)	2.10 (0.48)	1.80 (0.66)	1.63 (0.61)	21.983**
	Medium					
	High					
Illumination level	Low	2.63 (0.61)	1.97 (0.55)	2.30 (0.65)	1.83 (0.69)	32.047**
	Medium					
	High					
Space availability	Low	1.23 (0.43)	1.90 (0.48)	1.63 (0.61)	1.80 (0.71)	27.319**
	Medium					
	High					

Note: Figures in parenthesis standard deviation
** Significant at the 0.01 level (2-tailed)

Conclusion

A variety of factors including classroom and façade passageways, view, acoustics, interior furnishings, class size etc., might have a favourable or negative impact on children's ability to focus, according to a study done with a focus on children with ADHD, Autism, and Down’s

syndrome (Tufvesson, 2007) [19] Majority of the students considered their classroom size as moderate even though the size was low when compared with BIS standards. Intensity of light was also considered enough even though when the availability is comparatively very low. Opinion of students and the collected data regarding space availability in the classroom was similar. The results also show a great association between existing classroom interiors and opinion of students on their comfort in the classrooms. The overall study states that following standards while designing classroom and considering the opinion of students is crucial to help students adapt to their classroom and comfortably perform their assigned tasks.

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