

# ASSESSMENT OF COMPUTER LAB IN TERMS OF INDOOR ENVIRONMENTAL QUALITY AND FURNITURE

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## INTRODUCTION

User interface is one of the most important parts of any electronic device. The Human, the user is after all, the one whom computer system are designed to assist. Computers have become a necessity for home users as well as businesses today. It has affected many aspects of our daily life. Computer generate heat and harmful radiations so, proper IEQ (IEQ is indoor environmental quality which includes temperature, humidity, light, noise level) must be there in rooms where the users are working for their better health status. While using computers we generally sit in the class rooms, computer labs and offices etc on chair sitting is an activity – It's something people do. Sitting is active, involving motion, balance, position, posture, and control. People use seats to support themselves when they sit. Seating can be complicated. Understanding and correctly applying the ergonomics of office seating is critical to delivering work environments that are safe and support performance. Keeping the above points in view, we intend to study the satisfaction level of students in terms of IEQ and furniture in computer lab from the student's perspective with the following principal objectives to study the problems facing by the students while working in computer lab., to assess the indoor environmental quality in computer lab. And to assess the users satisfaction in computer lab regarding indoor environment quality.

## METHODOLOGY

This section encompasses the methods, techniques and various tools to be used for the study. The various methodological steps will be followed in the study described along with the relevant details under the following heads and subheads. First phase will be the experimental part and the second will be the interview cum schedule.

### Phase 1: Experimental part.

To study the environmental condition of computer lab following Parameters were studied

**Environmental Parameters:** Temperature, Lighting, Humidity, Air contaminants and Acoustics were measured using Thermometer, Lux meter, Hygrometer, Air quality monitor and Noise level meter respectively

All the environmental parameters viz. Temperature, Lighting, Humidity, and Acoustics were studied during the working hours. Data were collected in morning; afternoon and evening with three replications were taken for summer in computer room. Computer room was divided into five zones viz. East, West, North, South and central part and all the environmental parameter were carried out in all the zones at each floor of the room.

### **Phase 2: Interview cum schedule**

Assessment of Indoor environmental quality in computer lab and student's satisfaction level regarding indoor environmental quality in computer room was studied .

### **Locale of study and sampling plan:**

#### **Locale of study**

The computer lab of college of home science CCS HAU Hisar was the locale of study.

#### **Sampling procedure**

Samples of 70 students working in computer lab were selected randomly to check the satisfaction level with indoor environmental quality and furniture in computer lab.

#### **Tools for data collection:**

Two separate well-structured interview schedules were constructed for both categories of respondents for data collection on the basis of objectives, independent and dependent variables of the study. The data were collected personally by the researcher by administering the final schedule

#### **Variables and their measurement:**

##### **Independent variables**

### **PERSONAL AND DEMOGRAPHIC VARIABLES**

- Age, Education, Anthropometry measurements

##### **Dependent Variable**

- Temperature
  - Lighting
  - Humidity
  - Acoustics
  - occupant satisfaction
- } IEQ level scheduled

#### **. Analysis of data:**

The responses obtained for each of the question in schedule were suitably coded into a excel sheet and tabulated. Frequency, percentages & weighted mean were computed to assess the indoor environmental quality and furniture in computer lab.

## RESULTS

### Health analysis in terms of BMI and height

Table 1 depicts that majority (61.42 %) of the respondents were having mesomorphic body type i.e. having average body type. About one third had endomorphic body type and only 17.14 were having ectomorph body. Maximum respondents (42.86 %) were having the height in the range of 152.4-160.02 cm, one third were in height range of 160.02-167.64 cm, only 11.43% had height of <152.4 cm.

Table 2 highlights the Comfort level of students in use of computer chair. Back height got rank 1 in terms of comfort, followed by seat height and seat depth. The other parameters in decreasing order of comfort were Resiliency, tension, free float and arm height.

Feeling of discomfort among students after an hour of use had been presented in table 3. Maximum discomfort was in thigh (rank 1), followed by shoulders (rank 2) and Neck, upper arm, lower back, hands and feet got rank 3. Upper back and buttocks got 4<sup>th</sup> rank in discomfort level. The least discomfort was in forearms, followed by Mid back and Legs with rank of 5<sup>th</sup> & 6<sup>th</sup> respectively.

The upright position of the chair was most preferred by the students (62.85%), followed by about one fourth students who preferred partially reclined position and 11.42% with preference of totally reclined position( table 4)

A huge majority of the students (68.57%) preferred the computer screen at eye level whereas remaining 31.42 % didn't preferred at eye level. Out of these 45.71% preferred above the eye level and rest favored below the eye level. A thumping majority (77.14%) reported that traffic area were clear in the computer lab and 22.85% felt that it was not clear.

## FINDINGS

- Students were facing moderate difficulty in the area of seat height which was 48.57% , Back height 45.71%, Arm rest which was 37.14 , Resiliency 42.85.
- In neck, shoulder, upper back, upper arm, mid back, fore arms & lower back they were facing less pain or moderate pain.
- Students were facing problem with the placement computer screen as it is above eye level.
- The students were facing problem with glare of computer screen , ventilation, noise level

Table 5 highlights the environmental parameter of the computer lab which indicate that temperature and humidity were within the recommended level. Noise level was somewhat higher than the recommended level and lighting was less than the recommended level. Overall the environment was almost comfortable as noise was slighter higher and light was little lower than the recommended level.

In case of ventilation proper ventilators must be there or the room must have exhaust fans

**RECOMMENDATIONS****Table 6 : For chair (according to respondent's 95<sup>th</sup> percentile)**

Parameters	Self observed	Recommended (female)
Seat height	46.99 cms	43.18 cms
Seat depth	45.18 cms	43 cms
Seat width	40.64 cms	ok
Seat rest height	44.45 cms	ok
Cushioning at lumbar	6 cms	At least 10
Back rest width	43.18 cms	ok
Arm rest height	_____ no _____	26cms and adjustable
Elbow to elbow	50 cms	50 cms
Dist. Between arm to arm	55 cms	ok
Angle of seat	90 degree	75-80 degree
Angle of reclination	90 degrees	Adjustable to 110 degree

**SUGGESTIONS****For environmental parameters**

**Ventilation:** Proper ventilators must be there but there is a.c. so at least exhaust must be there when a.c's are not in use.

**Light:** Light must be increased. Now it is 264.4 lux it can be increased up to 500 lux in direction north east.

**Glare:** Screen of computers must be covered with screen guards to reduce the glare on screen.

**Noise level:** There was maximum noise created by farata fans. Ceiling fans must be used for reducing noise and noise absorbent furnishings can be used.

**Ideal work station and design of chair**

An ergonomically arranged workstation for desktop or laptop users promotes neutral postures. That is,  
 The neck should be aligned with the spine or, in other words, the ears should be positioned over the shoulders; the back should be supported by a chair to maintain the spine's natural curves--particularly the inward bending of the low back  
 the shoulders should be relaxed (not elevated or hunched);  
 Elbows should be close to the sides of the body and the angle of bending should be no greater than 90 degrees, and preferably less; and the wrists should be in a straight alignment with the forearms

## CONCLUSION

- Maximum strength falls under the category of Mesomorph according to Quetelet's index
- Maximum strength falls under the class interval (152.4-160.02) which between 5<sup>th</sup> and 50<sup>th</sup> percentile
- Students were facing moderate difficulty in the area of Seat height, back height, Arm rest which is resiliency.
- Except buttock, thighs, legs and feet in other areas including neck, shoulder, upper back, upper arm, mid back, forearms & lower back they were facing less pain or moderate pain
- Students were preferring upright position of chair for doing their task
- Students were facing problem with the placement computer screen as it is above eye level
- They were satisfy with traffic lanes (clear) or placement of furniture
- There was no such problem with temperature, humidity & light but the students are facing problem with glare from computer screen, ventilation and noise level.

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Table 1 Body composition and height of respondents

Parameters	Percentage
<b>Body type</b>	
<20 (Ectomorph)	17.14
20-25 (Mesomorph)	61.42
>25 (Endomorph)	31.43
<b>Height</b>	
<152.4 cm	11.43
152.4-160.02 cm	42.86
160.02-167.64 cm	31.43

Table 2: Comfort level of students in use of computer chair

Parameters	%age	%age	%age	%age	%age	weighted mean	rank
Seat ht.	0	17.14	48.57	28.57	2.86	19.43	2
Back ht.	5.71	17.14	45.71	37.14	5.71	22.29	1
Seat back rec.	0	17.14	37.14	45.71	0	19.20	3
Tension	0	22.85	28.57	31.42	5.71	17.71	5
Seat depth	0	8.57	48.57	40	0	19.43	2
Arm ht.	0	2.85	37.14	34.28	8.57	16.57	7
Free float	5.71	14.28	22.85	40	2.85	17.14	6
Resiliency	8.57	2.85	42.85	34.28	5.71	18.85	4

Table 3: Feeling of discomfort among students after an hour

Para meters	No pain	Less pain	Moderate pain	Extreme pain	Weighted mean	rank
	%AGE	%AGE	%AGE	%AGE		
<b>Neck</b>	14.28	42.85	37.14	5.71	25	3
<b>Shoulder</b>	31.42	32.42	31.42	5.71	25.25	2
<b>Upper back</b>	28.57	31.42	34.28	2.85	24.28	4
<b>Upper arm</b>	28.57	48.57	20	2.85	25	3
<b>Mid back</b>	14.28	40	34.28	2.85	22.85	6

<b>Forearms</b>	37.14	38.14	17.14	0	23.11	5
<b>Lower back</b>	25.71	51.42	17.14	5.71	25	3
<b>Buttocks</b>	42.85	28.57	22.85	2.85	24.28	4
<b>Hands</b>	40	42.85	11.42	2.85	25	3
<b>Thighs</b>	68.57	17.14	11.42	5.71	25.71	1
<b>Legs</b>	51.42	22.85	11.42	5.71	22.85	6
<b>Feet</b>	65.71	17.14	11.42	5.71	25	3

**Table 4: Preferences of students about position of chair**

<b>Position of chair</b>	<b>Percentage</b>
Partially reclined position	24.83
Totally recline	11.42
upright	62.85

**Table 5: Environmental parameters of the computer lab**

<b>Environmental parameters</b>	<b>Self observed</b>	<b>Recommended</b>
Temperature	30.3 degree c	26 – 32 degree c
Humidity	34.6%	40-60%
Noise level	75.34 dB	50-70dB
Lighting	245 lux	250- 500 lux