Anthropometric Consideration of Classroom & Studios at Derna University

Awatif Farag Bugaldaen
Derna University
Interior Architecture department

Salma Guma Ali Alghabaile
Derna University
Interior Architecture department

Abstract:.

Anthropometric considerations play in learning spaces an important role in improving the efficiency of a student. On the other hand, Anthropometrics is important in designing the products which suit the users. The classrooms and studios in Derna University to examine in terms of ergonomic view, analyze if they comfortable according to Anthropometric dimensions. Moreover, seating furniture plays an important role in making the workplace comfortable also suitable for the student. The study focused example, normal classroom and studios, in terms of measured dimensions of interior space, furniture dimension, activity circulation zoning, maintenance, dimensions compared to standard dimensions, that derived conclusion classroom is uncomfortable and unergonomic also studios, finding some negative issues in point of ergonomic.

Keywords: Ergonomics, Anthropometric consideration, Classrooms chairs design considerations, studios chairs design considerations

المستخلص

لمنتجات التي تناسب المستخدمين. تم فحص قاعات الدراسة والاستوديوهات في جامعة درنة من منظور بيئة العمل، وتحليل مدى راحتها وفقًا للأبعاد الأنثروبومترية. علاوة على ذلك، تلعب مقاعد الجلوس دورًا هامًا في جعل بيئة العمل مريحة ومناسبة للطلاب. ركزت الدراسة على القاعات الدراسية والاستوديوهات العادية، من حيث الأبعاد المقاسة للمساحة الداخلية، وأبعاد الأثاث، وتقسيم مناطق الحركة، والصيانة، مقارنةً بالأبعاد القياسية. وخلصت الدراسة إلى أن قاعات الدراسة والاستوديوهات غير مريحة وغير ملائمة من ناحية الابعاد الانسانية، حيث وُجدت بعض المشكلات السلبية المتعلقة ببيئة العمل

كلمات مفتاحية :

الارجونوميكيس , الاعتبارات الانثروبموترية , الاعتبارات التصميمية للقاعات , الاعتبارات التصميمية للمراسم

1-1 Problem definition

The classrooms and stuiods in Derna University to examine in terms of ergonomics standards,evaluate if they comfortable according to anthropometric dimensions

1-2 Research objective

This research aims to investigate the ergonomics dimensions in the classrooms and studios for improving the efficiency of students by encouraging and motivating them to perform better .

1-3 Significance of research

Study and analyze the importance point of view to anthropometric,and ergonomic considerations of the classrooms and studios .

1-4 Limitation

The study only about classroom and studios in Derna University from where ergonomics,therefore library and administration offices will not be discussed .

1-5 Methodology

This research would be a qualitative research using comparative analysis of ergonomics considerations . Data would collected from books . Therefore , this research contains: introductions ,ergonomics consideration of learning space , classrooms & studios descriptions , the final conclusion with a results.

What is ergonomics?

The word ‘ergonomics’ is derived from the Greek words ‘ergon’ (work) and ‘nomos’ (law). In the United States, the term ‘human factors’ is often used. A succinct definition would be that ergonomics aims to design appliances, technical systems and tasks in such a way as to improve human safety, health, comfort and performance.
The formal definition of ergonomics, approved by the IEA, reads as follows: Ergonomics (or human factors) is the scientific discipline concerned with understanding of the interactions among humans and other elements of a system.

Ergonomics can contribute to the solution of a large number of social problems related to safety, health, comfort and efficiency.(1)

1- Introduction

Anthropometric considerations play in learning spaces,an important role in improving the efficiency of a student , On the other hand the anthropometrics is important in designing the products which suit for the user,and accommodate for long periods of time.

The student spends long time a day at university campus also most of the time they are working in a sitting position in their classroom or studios space.

Many students are doing a seated position need to use a laptop, and writing or reading them considering to have suitable and comfortable furniture. Otherwise, they may suffer from back pain because sitting in an uncomfortable position for a long period of time.In addition, proper design for the classroom may be reduced muscular disorder and greatly helps students to increase their concentration during their lectures or their works.

1-1 Anthropometric considerations

Correct Anthropometric dimension the essential principle to have a good design and comfortable users, therefore, that the designer become familiar with the anthropometric consideration involved in the design in general. In this paper will study the generally basic dimensions of seating include seat height,seat depth,seat width,backrest height,and armrest height and activity circulation zoning,display for group viewings. (2)

2-Seat

2-1 Seat Height

The basic considerations of the chair design is the height of the top of the seat surface above the floor, if the seating surface is too high, as a result the thigh becomes compressed also this can cause considerable discomfort.On the other hand, if the height of the seat is too low, the legs may become extended.In addition, a tall person would be far more comfortable .

2-2 Seat depth

Another basic consideration in chair design is the depth of the seat.If the depth is too great,the front of the surface will press into the area just behind the knees,also will cutt of Circulation to the legs and the chair may become unsupported,body stability is weaker,as a result discomfort and back pain. (2)

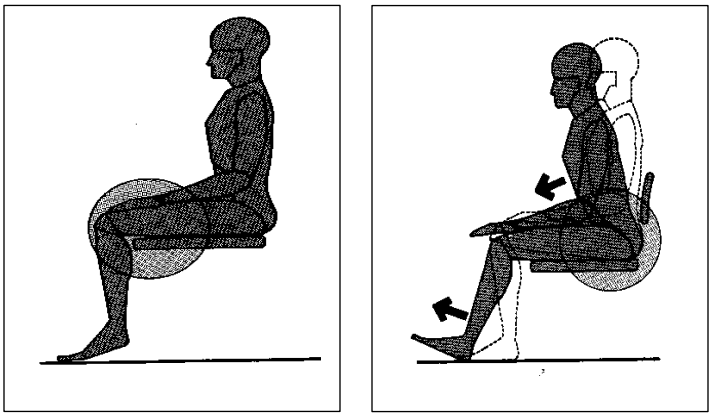


Fig N1,2 Human Dimension & Interior space

2-3 Backrest

The most important considerations,is the location of the backrest,
Necessary to ensure a proper fit between the user and chair.
The most an important function of the backrest is to provide
Support for the lumbar region or small of the back.Also, should
Be made for the protrusion of the buttock area.

2-4 Armrest

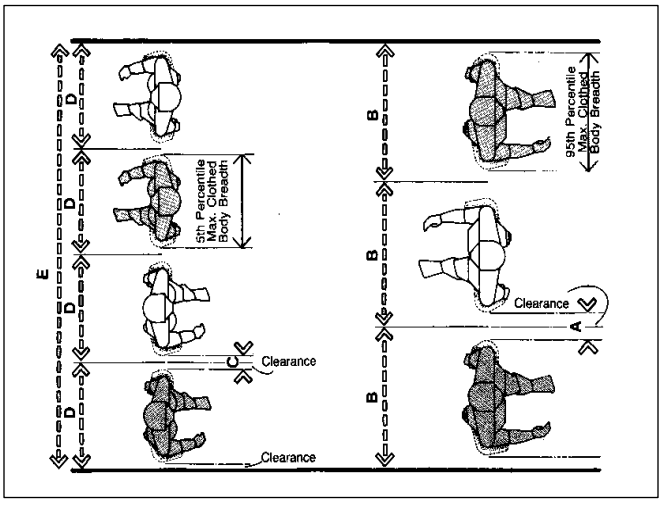
Another basic consideration in seating the armrests is an important to support the weight of the arms and assist the user in lowering himself into the seat or in pushing himself out of the seat.Anthropometric consideration must be taken into design the chair .(8)

Measurement	Men 95%	Women 95%
Popliteal Height	49.0	44.5
Buttock-Popliteal Length	54.9	53.3
Elbow Rest Height	29.5	27.9
Shoulder Height	63.5	63.5
Sitting Height Normal	93.0	88.1
Elbow-to-Elbow Breadith	50.5	49.0
Hip Breadth	40.4	43.4
Shoulder Breadth	48.3	48.3

Human Dimension & Interior space p.61

2-5Activity circulation zoning

Most adults,have a pacing distance between 61to 91.4 cm. On the other hand the distance one person has to be behind the other to observe him from the head to toe. This is about 213.4 cm. In addition a normal walking situation.In single-and double-Lan corridors and passageways,clearances of 91.4 and 172.7 cm.



A	11.4 cm
B	81.3 cm
C	4.1 cm
D	61.0 cm
E	243.8 cm

Human Dimension & Interior space p.268

3-Display for group viewings

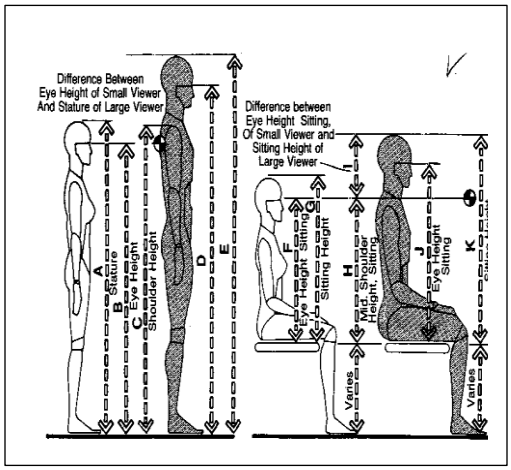
Fig N 3 Human Dimension & Interior space p.268

3-1 Height of Display

Generally, the height of the top of the display should relate to the eye of the viewer. Moreover, the variation in the eye heights of the tall and short seated viewer above the seat surface is much less than that of the eye height above the floor of tall and short standing viewers. In addition, the difference in eye heights of the latter is about 30.5 cm.While the difference between eye heights of the former, as indicated by the drawings, is less than 15.2

3-2 Display Angle

The angle of the display should place the viewing surface of the normal line of sight.



A	149.9 CM
B	143.0 CM
C	146.8 CM
D	174.2 CM
E	184.9 CM
F	71.4 CM
G	75.2 CM
H	69.3 CM
I	23.6 CM
J	86.1 CM
K	93.0 CM

Fig N 5

Fig N 4,5 Human Dimension & Interior space p.291,294

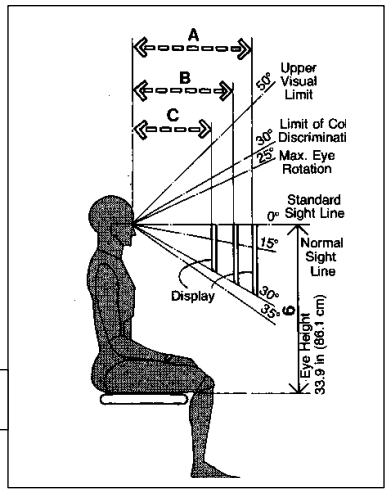


Fig N 4

A	71.1-73.7 CM
B	45.7-55.9 CM
C	33.0-40.6 CM

4- Studio consideration

4-1 Anthropometrical consideration in the studios area.

Nevertheless, the drawing offers some basic dimensions for use in making preliminary design assumptions. The following suggestions

(1) The angle formed by thighs and trunk should not be less than 105°. Angles significantly less than this will cause discomfort.

(2) Design should allow the user to change body posture.

(3) The front edge of the seat should be rounded to prevent irritation.

(4) The backrest should provide lumbar support by following the spinal contour in the lumbar region.

(5) The seat surface should tilt backwards.

(6) If the angle formed by the backrest with the vertical exceeds 30°, .

(7) Armrests should be padded and designed horizontally or at the same angle as the seat surface.

The following drawing provides basic dimensional information for the design of a drafting stool, which is similar in many respects to the secretarial chair. (2)

cm	
A	40.6–43.2
B	21.6–22.9
C	25.4–30.5
D	41.9–44.5
E	45.7–61.0
F	15.2–22.9
G	25.4 adjust.
H	39.4–40.6
I	30.5 max.
J	76.2 adjust.
K	38.1
L	30.5–35.6

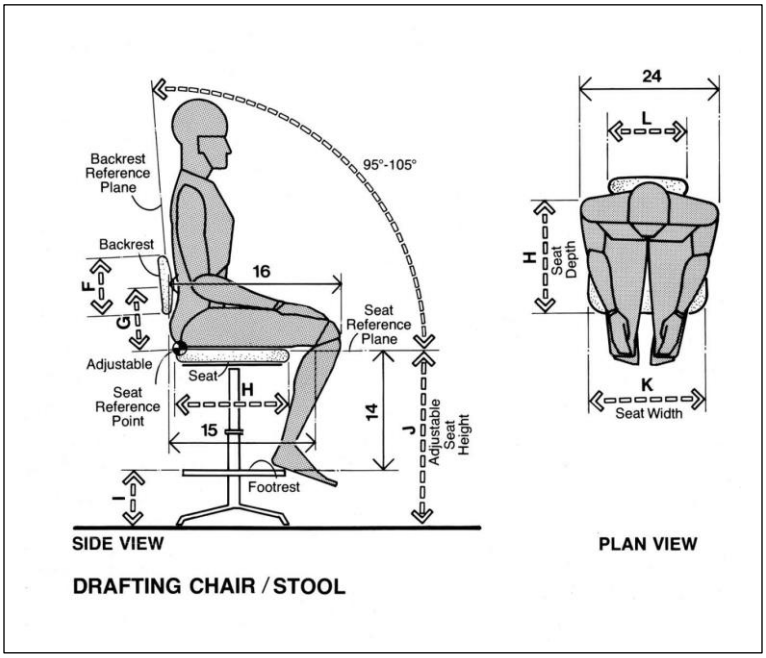


Fig N 6 Drafting Chair/ Stool

5- Ergonomic consideration data in learning space

5-1 Classrooms chairs design considerations

Generally, furniture which used in the classroom should be strong and durable. One the other hand The seat should be safe and healthy also comfortable. The seat should be broad and wide for complete body support. In addition the seat should facilitate foot to rest on the floor while sitting straight thighs and legs should have free moving space the chair should respect the basic people needs of left or right site.

One of the main health issues in the design of the chair is workplace is back pain. Also the most important in the chair is lumbar support in the seat and,a proper seating posture should be comfortable and permit users feet on the floor. (3)

5-2 tablet arm chair design considerations

The tablet arm chair must be able to kept the books and other needs for example bottle of water. Moreover, laptop. The tablet arm chair should be at the correct height and provide space to write comfortably.

5-3 Quality

Furniture in classrooms should be finishing a high quality seating and tablet arm chair they must be purchased to minimize the long term life cycle costs since funding for equipment replacement and repair.Also an important to be easy to clean.

Classroom analyze in Derna University

The analyst will be off:

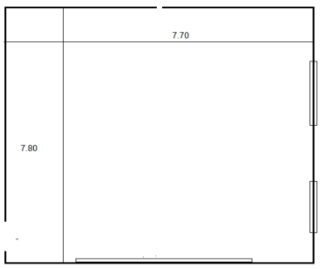
a- Dimensions of interior space
b- Furnishing
c- Activity circulation zoning
d- Maintenance

Fig 8 classroom

a- **Dimensions of interior space**

This classroom location in first floor in Interior Architecture department on the right site .

The interior space measurement in horizontal and vertical directions. Also, this classroom capacity is about 50 chairs.



Sketch N 1 Top plan classroom

Interior space	Horizontal	Vertical
Classroom	7.80 cm	7.70

Table N1 classroom dimensions

a- Furnishing

Analyze of seating

Generally movable furniture used in this classroom. Firstly, measurements of the chair available in the classroom obtained the information data through to taking photos and to doing sketches.

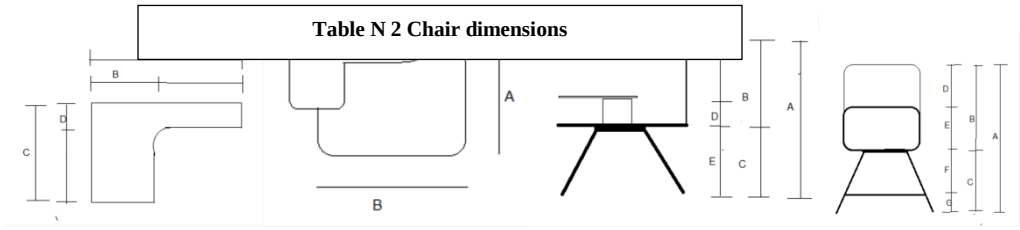
Fig N 10 student camera

Different sid of chair

Fig N 9 student camera

Siting depth	45.0 cm	Backrest height	38.0 cm
Siting width	40.0 cm	Knee Height	45.0 cm
Siting height	90 cm	Tablet arm chair	20.0 cm

Table N 2 Chair dimensions



Tablet arm chair | Plan | Section | Back side

Sketches N 2 Chair dimensions analyze

Tablet arm chair		
Tablet arm chair width	A	60 cm
Tablet arm chair depth	B	28 cm
Tablet depth	C	38 cm
Tablet depth	D	0.8 cm

Table N 3 tablet arm chair dimensions

Fig N 11 tablet arm chair

1- Door & windows dimension

The classroom door should have in generally the following:

- Appropriate height of the wall
- Reduce noise from closing the door
- The use of standard dimensions for doors in public places.

Fig N 12 door of classroom

An important part of most learning environments are windows

In general, Windows should be included in classrooms whenever possible.

Percentages of light diffusion will be determined for each window by

Because this window may be in the left site is will be better.

	Height	Width
Door	2.10 cm	1.08 cm
Windows	89.0 cm	2.60 cm

Table N 4 door and widows dimensions

Fig N 13 windows of classroom

b- Activity circulation zoning

The horizontal circulation spaces may include typical corridors in public buildings ranging from 152.4 to 365.8 cm is depending the human factor of body size and dimension.In addition, most adults have a spacing distance between 61to 91.4 cm

In single- and double in passageways, clearances of 91.4

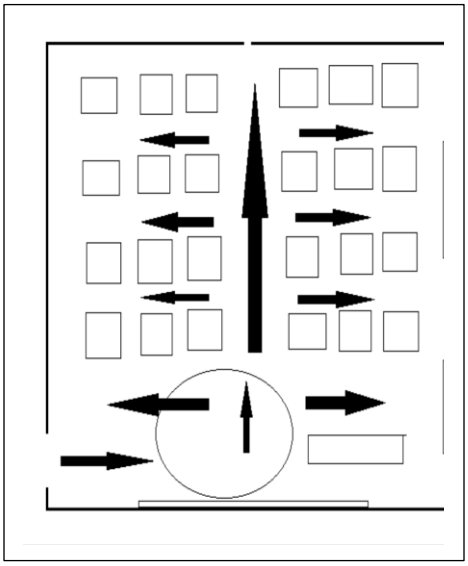
And 172.7 cm. In situation classroom the horizontal

Circulation spaces not clear because furniture is moveable

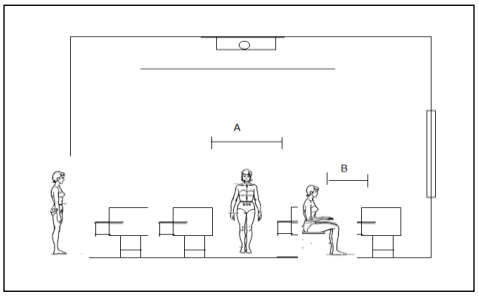
For example, between chairs, not there any passageways clear.

On the other hand between the board and the first-row seating

The clearance is enough to passageways.



Sketch N 3 Plan of classroom Horizontal circulation zoning



Sketch N 4 Section of classroom activity circulation zoning

A	Max body breadth	65.5 cm
B	Max body depth	36.8 cm

Table N 5 body dimensions

2- Screen& marker board

To design for display must be responsive to both the anthropometric and visual consideration involved . Eye height , for example, sitting communication system design Also, consideration must be given to the problem of a very tall viewer and a very short viewer in general, the minimum distance between the first row and the eye of the viewer at an angle between 30° – 33° .

Board width	3.65 cm
Board depth	1.20 cm
Board height from floor	0.90 cm

Table N 6 board dimensions

Fig N 14 sreen & marker board

- **A result of analyze in the classroom**

Classroom dimension in point of ergonomics

Furniture	Ergonomics dimension	Exiting dimension	
Chair dimension			
Siting height	78.7 – 83.8cm	90.0 cm	×
Siting depth	39.4 - 45.7cm	50.0 cm	×
Siting width	45.7 – 50.8cm	40.0 cm	×
Knee Height	40.6- 43.2cm	45.0cm	×
Backrest height	43.2 – 61.0cm	45.0 cm	√
Footrest height	30.5 cm max	20.0 cm	√
Tablet arm chair			
Tablet arm chair Depth	20.5 cm	38.0 cm	×
Tablet arm chair Width	9.06 cm	60.2 cm	×
Door height	2.10 cm	2.10 cm	√
Windows height	90 .0 cm	89.0 cm	×
Horizontal circulation	152.4 - 365.8 cm	2.40 cm	√
Board width	-	3.65 cm	-
Board depth	-	1.20 cm	-
Board height	71.1-73.7 cm	0.90 cm	√

Table N 7 classroom dimensions comparision with ergonomics data

Generally, the learning space should designed with basic ergonomic specifications, desks, seating.

neck, shoulder, and back stress, armrest can provide good surface area.Moreover, the armrest should be adjustable up and down, this allows for more customization and for better control, as a result, can be the comforting but, in this laboratory chair is uncomfortable users.-

- **A result of analyze in the classroom**

Conclusion

	Positive or negative from point of ergonomic	Problem
1- Classroom furniture		Comfortable
Safe and healthy	×	Un comfortablee
Good materials	×	Un comfortablee
Armrest	×	Only tablet for writing
Lumber back	×	Un comfortablee
Mobility	×	Circulation zoning not clear
Depth ,height ,width	×	Un comfortablee
Tablet arm chair and footrest	×	Un comfortablee
Board, screen	√	No problem
Door & window	×	problem
Maintenance	√	It can be able to repair
Chair	×	Uncomfortable no lumber and arm

Table N 13 positive or negative point from ergonomic view

As shown in the table N 13 the classroom is a uncomfortable ,unhealthy and not easy to clean the main problem was in horizontal clearance it was not clear because the furniture used is movable, it can be used chair fixed on the floor. One the other hand the chair has an only tablet chair for writing according to ergonomics standers,not uncomfortable, in general was uncomfortable and unergonomic.

RECOMMENDATIONS

According to the study, analyze of learning space, there is some recommendation can be helped to design this type of spaces :

-Seating in learning space needs to be strong and stable since it is used for long periods

-Furniture at the user in learning space, it can be as possible, safely, comfortable and healthy.

-An important way to design furniture according to body dimension

-Generally, furniture in learning space should be the product of good materials and high-quality because will be easy to clean and support the body size.One the other hand will be comfortable.

References

1 Ergonomics for Beginners A quick reference guide Second edition Jan Dul and Bernard Weerdmeester- TA 166 .D78 2001 620.8’2–dc21 00-053265 ISBN 0-7484-0825-8 (pbk. : alk. paper) This edition published in the Taylor & Francis e-Library, 2003. ISBN 0-203-21209-6 Master e-book ISBN ISBN 0-203-26952-7 (Adobe eReader Format

2 -Human dimension & interior space by Julius Panero, AIA,ASID AND Martin ZELNIK,AIA,ASID

3-EH&S Design Guide General Requirements for Stanford Laboratories . https://www.ehs.washington.edu/fsodesignrev/s1genreqsforlabs.pdf