ACADEMIC ASSAYS FOR ERGONOMICS.

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RESUMEN. Se presentan dos ensayos realizados en la Facultad de Arquitectura, Diseño y Urbanismo (FADU). En el contexto interactivo de las carreras de Arquitectura y Diseño de Interiores, se desarrolló un estudio básico del ambiente acústico que incide en el aula, por otro lado se hace una aproximación de análisis antropométrico de nuevo mobiliario para los talleres de diseño.

El estudio acústico tiene como finalidad que el alumno se sensibilice con la noción ergonómica y se familiarice con herramientas elementales, como el decibelímetro, para diagnosticar y controlar el ambiente sonoro, ahora a nivel escolar, pensando en su aplicación en entornos reales. Se sigue un método de medición simple, en una secuencia predeterminada de espacios. Se obtienen indicadores no del todo adecuados para un óptimo ambiente de aprendizaje.

El diagnóstico de mobiliario se aplica en un juego de restiradores “gemelos”, con dimensiones establecidas por el fabricante. Se aplica una técnica de observación de postura relacionada con el alcance y la holgura, de usuarios en interacción con el mueble, de una muestra de la población estudiantil en la FADU. Los resultados llevan a la reflexión de cómo la aparente comodidad puede ser realmente una lastimosa costumbre, a ser cultivada en los años de carrera universitaria.

Palabras clave: Interiorismo. Bienestar. Ergonomía. Acústica. Antropometría.

ABSTRACT. We present two tests conducted at the Faculty of Architecture, Design and Urbanism (FADU). In the interactive context of careers in Architecture and Interior Design, it was developed

a basic study of acoustic environment impact in the classroom. Then it was applied an simple anthropometric analysis on new design workshops furniture.

The acoustic study aim was to sensitize students about ergonomic notion and become familiar with basic tools such as decibelímetro, diagnose and control the sound environment, now at school, thinking about its application in real environments. It was followed a simple measurement method, in a predetermined sequence of spaces. Obtained indicators were not entirely appropriate for optimum learning environment.

The diagnosis of furniture applies drawing board in a game of "twins", with dimensions specified by the manufacturer. It was applied an observational technique of scope and slack related posture. User - furniture interaction was observed of a sample of the student population. The results lead to the reflection of how the apparent comfort can be really a pitiful habit to be cultivated in the years of college.

Keywords: Interiorism. Welfare. Ergonomics. Acoustics. Anthropometry**.**

PROLOGUE.

We present two academic assays conducted at the Faculty of Architecture, Design and Urbanism (FADU)

In the interactive context of Architecture and Interior Design careers, it was developed a basic study of acoustic environment impact in the classroom, besides an approximation of anthropometric analysis of new furniture for the design workshops. Both exercises are strategies to reduce the gap between design activities and ergonomics, as well as linking quality as a daily practice.

Ergonomics as inherent quality factor should be fully present in the field of design. In practice it is found that various educational trends, not necessarily provide consumers welfare in their models.

The environmental experience as part of the learning process is student-way reference in its professional life. Hence the need to reorient educational objectives in design.

Exercise 1: Acoustic study of a learning environment.

1.1. INTRODUCTION. Conceptual Framework.

As part of the exercise was revised conceptual framework based on Mapfre Foundation Ergonomics Handbook

Ergonomics deals with the study of any physical environment from three sources: the measurable factors of the environment that are susceptible to modification, the physiological effects produced by these factors and also how the employee feels that environment. The sound from the physical point of view is a mechanical vibration transmitted through the air, capable of being perceived by the auditory organ.

1.1.1. Sound effects in people.

The sound effects can occur in people from three aspects: perception, extra-auditory effects, auditory effects.

Perception.

The inner ear acts as a transducer, transforming the physical signal (mechanical) in physiological signal (nervous), which is transmitted through the auditory nerve to auditory cortex, which produces the integration and interpretation of those signals.

Extra-auditory effects.

The fact that noise can cause physiological reactions of "stress" seems widely accepted, but has

not yet established that these reactions can produce pathological effects. However, an analysis of more than one hundred relevant literature indicates that the most important are:

Modification of the cardiovascular system: blood and heart rate.
Influence on muscle tone.
Digestive disorders.
Visual function alterations.
Alterations on metabolism.

Auditory effects.

The auditory effects are: injury to the ear and difficulty in language comprehension. For the scope of the study, was only considered the first. In an environment where understanding of the word difficult, is very likely that there are difficulties that will lead to discomfort for the worker and work impairment. The spoken word is a sonic element with high information content, so the process of perception is determined by various acoustic phenomena and the special interpretation of the message conveyed by the word.

1.1.2. Acoustic comfort.

The type of noise that bothers more in an office environment, is produced by the talks. Each type of activity will be treated differently. Can be generalized in terms of noise levels, noise in manual labor began to be troublesome from 80-90 dB, matching the levels from which they can and assume the risk of deafness.

1.1.3. Effectiveness.

Noise can alter a person's efficiency decreased performance and increased errors and accidents. Rates were determined for intellectual work discomfort, for example Beranek (1969) and Wisner, setting graphic curves correlated noise level in decibels and octaves center frequencies. The scope of this assay was limited to a simple sequence of measurement, but checking on the charts for better understanding by students. (Mapfre Ergonomics Manual)

1.2. OBJECTIVES.

Sensitize Interior Design students on the need to adapt the environmental conditions for human activity, in this case, learning. To learn the use of simple measuring sound tools, to diagnose and monitor a sound environment.

1.3. METHOD.

It was simplified to an academic exercise, the procedure established in the Mexican Official Norm for the security about noise sources. So, establishing six significant locations in the FADU campus, the sound pressure was measured. It was used a type 1 sound level meter, with a range of 50 to 120 dB, for capturing only the sound pressure.

The group of 15 students made measurements in the selected areas thus obtained 90 different indicators. For practical reasons the group was subdivided into two: seven people were devoted to three sites, and 8 to the other three areas. It was registered measurements taken in each area for a period of five minutes, for each student.

1.4. RESULTS.

The entire series averages were obtained, performing a table summarizing the average of the measurements (see Table 1). The teacher previously presented in the classroom as an introduction to the exercise and how to do it, including a concise explanation of the sound level meter use.

Table 1. Sound Pressure measurementes.

Site.	Sound Pressure. dB
Exterior environment (far away site)	40
Class room	67
Library.	64

Laboratories (under construction)	71
Patio.	66
Cafeteria.	73

We compare the results:

a) With the recommended values in the corresponding official Mexican standard, which is 68 dB from 6:00 to 22:00 and 65 dB from 22:00 to 6:00.

b) With the levels recommended by the ILO (OIT).

c) It was showed the graph produced by Beranek. Although not conducted a detailed acoustic study to develop positions on the curves plotted, the models allow students to view individual cases.

It is noted that approximately 55-90 dB levels for intellectual labor, it is extremely painful, depending on sound frequency.

Table 2. Sound Pressure levels. OIT (ILO).

Effect on humans	**Sound Level dB.**	**Sound source.**
Extremely harmful.	140	Jet engine unit.
	130	Riveter.
	120	**Pain threshold.** Propeller aircraft.
Harmful.	110	Rock drill. Chainsaw. Metalworking shop.
	100	Truck.
	90	
dangerous.	80	Busy street (car traffic)
Prevents talk.	70	Passenger car.
	60	Normal conversation.

Irritant.	50	Talk quietly.
	40	Music played on radio at low volume.
	30	Whispers.
	20	City quiet floor.
	10	Whisper of leaves (vegetation).
	0	Hearing threshold.

1.5. CONCLUSIONS.

It was expressed by the group the distinction of sounds within the classroom and outside, the habit of perceiving external sounds as part of the learning environment, like a sound accompaniment. Especially noticed some discomfort because the dominant noise abroad, is to talk out loud.

Regarding the Library, a combination of whispers, voices, noise from air conditioning equipment, produce anxiety and stress in the interior. Inside the cafeteria, conversation is difficult because of the noise.

It was found that the materials used in buildings are not insulated or sound-absorbing. They are generally flat surfaces finished in painted cement, windows aluminum bearing. Also it was noted the classrooms air conditioners, as sources of noise.

The exercise participants were sensitized on to consider ergonomics to achieve acoustic comfort in the spaces.

2. ANALYSIS OF NEW DESIGN WORKSHOPS FUNITURE.

2.1. INTRODUCTION.

In Design learning, we consider the experience as a key factor. Since the products generated will be used by users, which we seeks to satisfy. Considering as example the model of Kolb (1984), the traditional tendency is to exercise the conceptualization phase mostly in institutions. Taking a side step, we invited a group of students to think about their academic work. Leaving aside the conceptualization only about ergonomics, was experienced and observed the use of furniture for design: a drawing desk prototype.

2.2. OBJECTIVES.

The student through observation, conceptualization and experimentation known anthropometric parameters.

2.3. METHOD.

Concepts were presented using anthropometry concepts and anthropometric tables, considering the scope and parameters of clearance,

It was conducted a simple anthropometric prototype drawing board "Twins." Continued as a methodology: analytical observation of the furniture in situ and photographs, analysis of simulated activity in furniture-user interaction, considering heights from 1.65 to 1.83 meters, in both sexes. The positions were static. It took anthropometric reference tables published by Prado-Ávila (2007).

Observations were made of the furniture itself and users interacting with the furniture. There were registered users feelings about.

It was made a physical survey of the furniture. It consists of two drawing tables linked by a metal structure made with angles of different caliber and length. Among these was placed additional shelf. The seat is circular, wood, supported on a rotating structure, a wheel support flange at the base, allows translation moves, subject to a pivot (see Figure 1). At first glance it seemed interesting.

Figure 1. “Twins” Drawing Board Prototype

They were invited to use the furniture first requesting suit as they liked it. Later they went in static postures leading to experience and visualize the scope and clearance parameters, comparing dimensions between the object and the person.

2.4. RESULTS.

Discoveries:

The table surface measures 70 x 80 cm which is insufficient to work in a drawing paper sheet, in addition, there is no support for the drawing tools on the table and they could slip. Other coating is also recommended as this would prevent the tape off the ground especially because the climate humidity.

It is needed an convenient adjustable board angle; it was fixed. Since the scope distances ratio from the user's fingertips on the furniture, creates an awkward bend in the lower back and also high tension in the shoulders and neck. Raise the height floor-edge of the table (0.91 mts.) would help to correct posture, facilitating work with the spine erect. For 95th percentile person said he felt comfortable until he was told to straighten the back (see Figure 2).

Figure 2. Working posture: "comfortable" and erect. Percentile 95.

It is suggested that in addition to the intermediate table support, useful for holding backpacks or bags, adding a drawer along the front edge of the table in each module for drawing and painting tools at hand. It is recommended to add a table with pen holders, whose support is articulated, at least one of the vertical bars of the support desk, and free rotation adaptable to the scope of the user. This little shelf complement the user's work when to laptop use is needed.

Regarding the seat, it was noted the absence of lumbar support (lower back), plus the hard, flat surface is uncomfortable after a while of use, is proposed to be padded, in a broader measure even for obese people, as default timber is still important to be configured curves of the buttocks and knee. It would be advisable to consider a footrest support tube in the bank, and the swivel seat is height adjustment screw. People in 5th percentile needed to rely on tip toes on the ground (see Figure 3).

Figure 3. Sitting posture Percentile 5.

2.5. CONCLUSIONS.

Continuing the efforts to sensitize the academic population at the Faculty of Architecture, Design and Urbanism of the UAT, to update the application of ergonomics, we believe these tests successful. The training process needs to adapt to the dynamic professional. In the field of design, experience is gained from learning in workshops and classrooms.

In the second exercise, underwent an apparent "comfort" in the use of furniture design from the anthropometric point of view, and recognized awkward postures. The experience generated improvement ideas.

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