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COMPATIBILITY OF CHAIRS AND TABLES IN COMPUTER LABORATORY TO THE STUDENTS' BODY DIMENSION: AN ASSESSMENT

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ABSTRACT

This study determined the compatibility of cahirs and tables in computer laboratory to the students body dimension at the Lyceum of the Philippines University, Batangas City. Descriptive type of research method was utilized in the study. The researchers used large and small anthropometer and tape rule from the ergonomics laboratory of the university to measure the body dimension of the students. The researchers found out that the average of the body dimensions (shoulder width, hip width, back length, buttock popliteal length, knee height, and elbow height) of the engineering students are fit to the existing computer laboratory chairs and tables. Only five of 81 students that the researchers interviewed have said that they are not comfortable when they are using computer in the engineering computer laboratory even though their sizes are fit to the existing computer laboratory chairs and table.

Keywords: Compatibility, ergonomics, computer laboratory, LPU

INTRODUCTION

The natural and man-made environments the people live and work within vary greatly. In daily life we accommodate ourselves to this environment in variety of ways. They employ heating systems and wear warm clothing when the atmosphere is cold and use cooling systems and wear light clothing when it is hot. People turn up the light when it is dark and shut our doors against loud and undesirable noise.

Workplace is one example of physical work environment. It is a place where one works, be it a workbench, an assembly –line station, or a desk. In all cases, tools, parts, equipment, and other devices must be located in easily accessible locations if people are to work productively in comfort and good health for protracted periods. Tools and equipment must also be appropriately sized so that they fit the people using those (Lehto & Buck, 2008).

Like in everyday experience people use all sorts of physical environment and facilities, such as chairs, seats, tables, automated bank tellers, video games, and football helmets. In the use of such things we have found that their design features of such things is comfort. There are other relevant criteria such as related to work performance, safety, and physical effects. But some facilities people use and the methods of work that are followed have a major impact on posture. In this regard, the most important consequences of improper posture are with respect to spinal problems (Sanders & McCormick, 1987).

At the most basic level, the goal of the ergonomic designer is to ensure that the work environment is safe, comfortable, and conductive to the task people need to perform. Sitting is sometimes synonymous with relaxation itself. Less physical effort is required in sitting than in standing or walking. Whether at work, at home, at horse races, on buses, or elsewhere,

the members of the human race spend a major fraction of their lives sitting down. As we know from experience, the chairs and tables we use cover the gamut of comfort and discomfort.

The right chair and table designs for its compatibility, means having the right dimension which complements the body measurement of the users. Simplicity, functionality, adaptability, and compatibility are the common denominator to have the right design for a wide variety of students (Custodio et.al, 2005).

To meet the needs of the changing world, the chair and table design should adapt to the needs of the users. Improper design of chairs and tables also can affect the work performance of people and can contribute to backaches and back problems. The back problems triggered by improper posture arise principally from the pressures exerted by the vertebrae on the disks between them (Sanders & McCormick, 1987).

Indeed sitting requires less physical effort than standing or walking but when the period of sitting is prolonged; stress is experienced causing pain on the lower back of the body. Numbness and discomfort are experienced as blood struggles to return to the heart from the feet and legs. All of these can be hampered by simple gravity and aggravated by poor chair and table design (Custodio et.al, 2005).

In completing a job in a workplace, people do many of their tasks sitting in front of the tables, work benches, desks, or other flat work surfaces. Like in offices and school laboratories especially in computer workstation of LPU College of Engineering, sitting is the most common practices of the students.

The computer workstation of engineering students consists of laboratory furniture such as tables and chairs. There are approximately 30 students using the laboratory consuming about three hours every meeting of the class. Chairs and tables used in the laboratory were purchased from the school supplier.

Even though the right ergonomic chair and table in the computer laboratory workstation of Engineering should fit the size of the users, the chair and table design for use at educational institution must be compatible and suit the larger population of the students. Hence, the decision was made to determine the compatibility of engineering computer laboratory tables and chairs with students' body measurements.

MATERIALS AND METHODS

The study used the descriptive method of research. Descriptive research, also known as statistical research, describes data and characteristics about the population or phenomenon being studied.This research utilized the descriptive method of research wherein the researchers used questionnaires and conducted interviews and actual measurements in gathering information regarding the topic (en.wikipedia.org/wiki/Descriptive_research).

Substantial information was gathered from books, documents, internet and unpublished thesis about the compatibility of LIMA Engineering computer workstation to the student's body dimensions considering the following variables: seat pan, seat height and backrest (Custodio et. al, 2005).

Respondents of the Study

The respondents of the study were composed of 81 students from the College of Engineering enrolled in Computer Aided Design Course, Programming and Information System for S.Y. 2012-2013. Forty three (43) students were from Computer Engineering, 30 students from General Engineering, four (4) from Mechanical Engineering and two (2) from Industrial and

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Electronics Engineering. The following students were selected with the basis of the period of time they spend in sitting. One hundred percent (100%) responded to the questionnaires.

Data Gathering Instrument

The researchers used the questionnaire given to the respondents who utilized the engineering computer laboratory in the university. The researchers used essential information from ergonomic references and the internet. A set of questionnaire was used to know the experiences of the Engineering students of LPU towards the compatibility of the computer tables and chairs with the user's body dimension.

The questionnaires were checked and noted by the adviser. It was revised until the instrument was finalized. The improved form was distributed to the subjects of the study. The data collected were analyzed and tabulated according to their courses, ages, height, weight and gender.

In gathering the dimension of the engineering computer laboratory tables and chairs, the researchers used large and small anthropometer and tape rule from the ergonomics laboratory.

Data Gathering Procedure

The measuring instruments are borrowed properly from the ergonomics laboratory by filling up the request form signed by the adviser. Before the data gathering, the proponents make sure that the respondents and their professor are aware that the researchers will conduct a survey and body measuring by presenting permission letter.

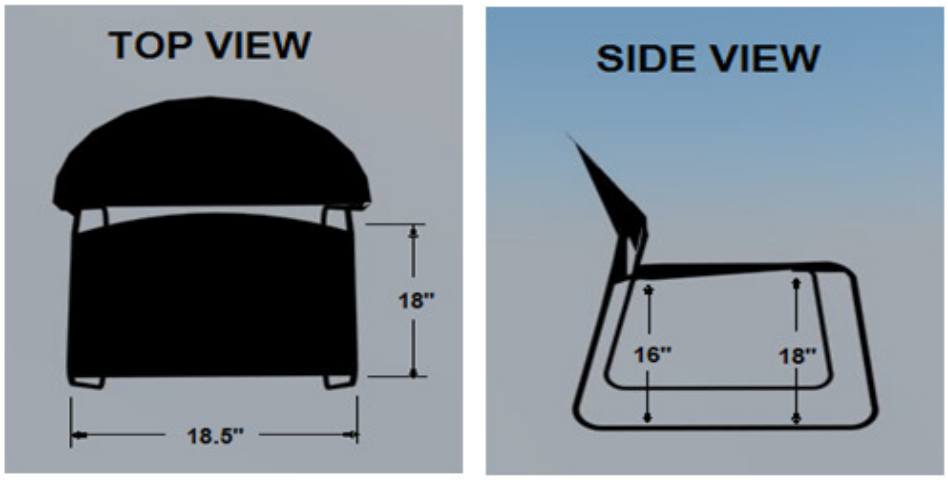
Statistical Treatment of Data

Data were analyzed using the descriptive statistical tools. Frequency count, percentage, and cumulative frequency were utilized in this study.

RESULTS AND DISCUSSION

The Design Quality Description of the Engineering Computer Laboratory Furniture

This section presents the quality description of the table and chair in engineering computer laboratory. This is an ergonomically designed plastic adult size chair which is made up of steel legs. The tables are made of wood with adjustable keyboard rack, and rollers. There are forty seven computers and tables in the laboratory.



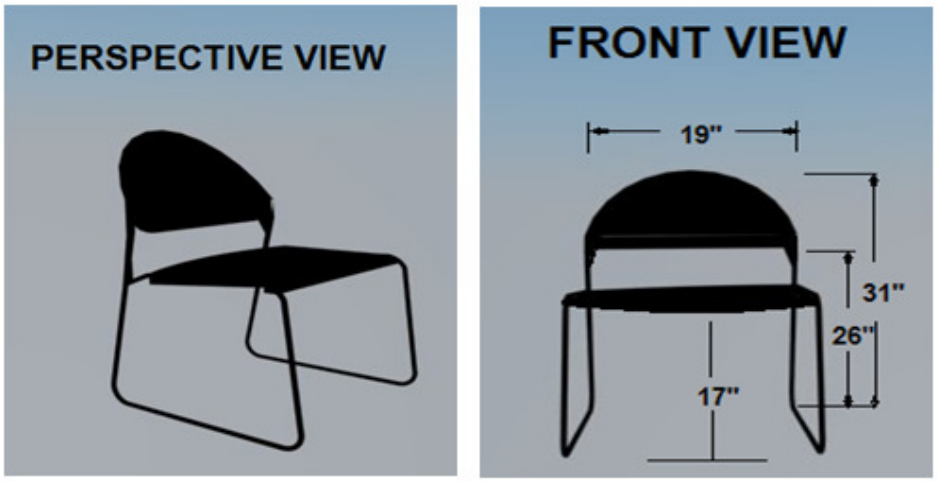


Figure 1. Dimensions of Computer Laboratory Chair

Figure 1 shows the dimensions of the computer laboratory chair. This also shows the isometric view of the chair with its respective measurement.

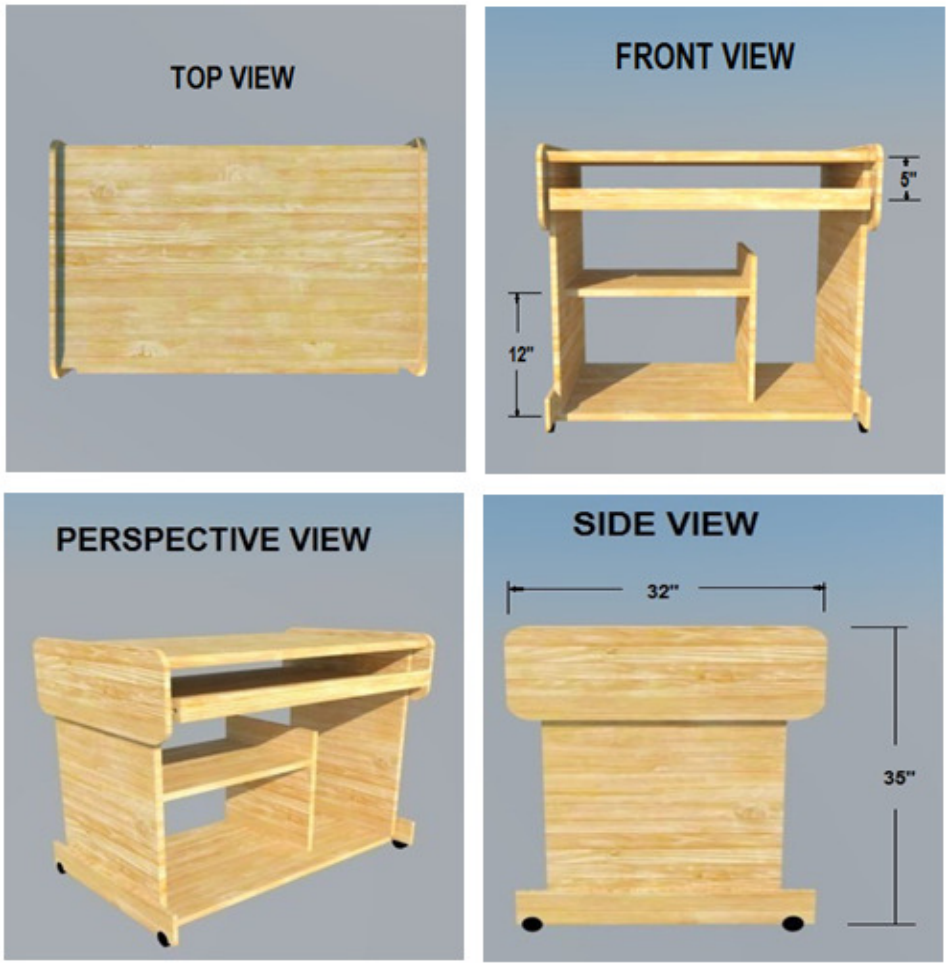


Figure 2. Dimensions of Computer Laboratory Table

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Figure 2 illustrates the orthographic projection of the design of the table used in the computer laboratory at the Lyceum of the Philippines University.

Table 1. Frequency Distribution of Respondents in Terms of Height

Height	*Frequency*	*%*
4'9"	1	1.23
5'0"	10	12.35
5'1"	2	2.47
5'2"	11	13.58
5'3"	5	6.17
5'4"	3	3.70
5'5"	10	12.35
5'6"	10	12.35
5'7"	14	17.28
5'8"	8	9.88
5'9"	3	3.70
6'0"	1	1.23
6'1"	2	2.47
6'2"	1	1.23
Total	*81*	*100*

Table 1 shows the height of the respondents ranging from five feet up to six feet. In the height variable, the smallest student is reaching 4'9 and the tallest student is reaching 6'2. The majority has an average height ranging from 5'5" to 5'7".

Table 2 shows the perceptions of the respondents regarding the compatibility of the chairs and tables in the computer laboratory

Table 2. Compatibility of Engineering Computer Laboratory Furniture to the Users

	Compatibility of Chairs and Tables	*SA*	*A*	*D*	*SD*	*WM*
1.	The chair is designed to do all the assigned tasks.	15	73	5	7	2.95
2.	The chair is designed for sitting upright, with hip, knees and ankles all at right angles.	15	69	10	6	2.93
3.	The chair is stable when leaning with the back bodice.	17	68	**7**	**7**	2.95
4.	The chair is stable when leaning with the front bodice.	11	68	14	**7**	2.83
5.	It is comfortable to get in and out of the chair.	16	65	10	9	2.89
6.	The table height provides ease in doing the assigned tasks.	22	67	7	4	3.07
7.	The table is wide enough to do all the assigned tasks.	23	72	7	1	3.12

The chair is assigned to do the tasks" that 73 percent of the population agreed and 1 percent of the respondents said that they are strongly disagreed. While only 15 percent of the respondents said that they are strongly agree and 5 percent of the respondents said that they

disagree in the statement. Chair is designed for sitting upright, with hip, knees and ankles all at right angles" that 69 percent of the population is agreed and 6 percent of the respondents said that they are strongly disagreed. While only 15 percent of the respondents said that they are strongly agree and 10 percent of the respondents said that they are disagree.

Chair is stable when leaning with the back bodice that 68 percent of the population are agree and 7 percent of the respondents said that they are strongly disagree, while only 17 percent of the respondents said that they are strongly agree and 8 percent of the respondents said that they are disagree.

Chair is stable when leaning with front bodice that 68 percent of the population agreed and 7percent of the respondents said that they are strongly disagreeing, while only 11 percent of the respondents said that they are strongly agree and 14 percent of the respondents said that they are disagree.

Comfortable to get in and out of the chair" that 65 percent of the population are agree and 9 percent of the respondents said that they are strongly disagree, while only 16 percent of the respondents said that they are strongly agree and 10 percent of the respondents said that they are disagree.

Table height provides ease in doing the assigned tasks that 67 percent of the population answered agree and 4 percent of the respondents said that they strongly disagree in the statement, while only 22 percent of the respondents said that they are strongly agree and 7 percent of the respondents said that they are disagree.

The table is wide enough to do all the assigned tasks that 70 percent of the population are agreed and 1 percent of the respondents said that they are strongly disagreed, while only 22 percent of the respondents said that they are strongly agree and 7 percent of the respondents said that they are disagree.

Anthropometrical Measurements That Could Be Used To Improve the Engineering Computer Laboratory Furniture

Table 3. Anthropometrical Measurements

Category	*Gender*	*Mean*	*Sd*	*Percentile 95th*
Shoulder Width	Male	41.6	2.6	46
	Female	37.6	3.6	44
Hip Width	Male	38.6	3.2	44
	Female	36.2	3.88	43
Back Length	Male	52.4	3.96	59
	Female	47.5	5.53	57
Buttock Popliteal Length	Male	44.7	4.02	51.3
	Female	43.95	4.06	51
Knee Height	Male	43.04	3.4	49
	Female	41.8	5.07	50.2
Elbow Height	Male	57.92	3.7	64.03
	Female	55.6	4.8	64

To determine the 95th percentile, use k= 1.65

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Anthropometrical measurements are very important to the design for human usage. These measurements are very essential to the initial design of equipments. These measurements are the primary considerations made to come up with an ergonomic design.

Table 3 shows the important body measurements critical to the design of the existing computer laboratory chair and table. In the design of a facility, consideration of gender is important because generally, males have larger built than females. The mean value of every measurement is calculated for both male and female respondents to come up with a 95th percentile values. These are critical to the comparison of the measurements of the chair design. These will be the basis of analysis if the existing computer laboratory chair and table can accommodate 95th percentile of the students using the computer laboratory.

Table 4. Percentile Relation to Existing Computer Laboratory Furniture's Measurements

Category	*Gender*	*95th Percentile Values*	*Chair Measurement (Cm)*	*Table Measurement (Cm)*	*Percentile Relation*
Shoulder Width	Male	46	48.3		High
	Female	44			High
Hip Width	Male	44	47		High
	Female	43			High
Back Length	Male	59	38.1		Low
	Female	57			Low
Buttock Popliteal Length	Male	51.3	46		Low
	Female	51			Low
Knee Height	Male	49	46		Low
	Female	50.2			Low
Elbow Height	Male	64.03		89	High
	Female	64			High

Table 4 shows the percentile relationship to the existing laboratory chair and table measurements. As seen in the table, the percentile relation in the respondents' shoulder width, hip width, elbow height to the chair measurement are high which means that the following body dimensions of the majority of the respondents are fit to the computer laboratory chair.

The percentile relation in the back length, buttock popliteal, length knee and knee height of the respondents to the chair are low, means that the back length of the majority of the respondents is not fit to the computer laboratory chair. The percentile relation in the respondents' elbow height to the tables' height are high, means that the height of the computer laboratory table are comfortable to the majority of the respondents.

CONCLUSIONS AND RECOMMENDATION

After further study and evaluation, there are other problems that may be considered in the compatibility of the computer workplace aside from the dimensions. The standards or recommended design for seating by some ergonomist is exhibited by computer laboratory of engineering. There are problems exist in the computer laboratory working station. The computer laboratory chair has short back rest and it may cause back aches for the users. The computer laboratory table is uncomfortable because it is a little higher than the user's elbow height and may cause hand muscle pain. This is determined through the survey which shows that some of the students disagree in the compatibility of computer laboratory furniture with their body dimensions. These problems occur in the students which are tall, short or obese. There are no proper dimensions in computer laboratory furniture for the students because of the tall users and the short users of tables and chairs. There are some anthropometric mismatches in seated work like the desk is too high (above elbow height) and seat too high (elbow rest too high).

Because the back rest of the computer laboratory chair is too short for the students, provide higher back rest to avoid back aches and to make their seat more comfortable and relax. The other existing dimension of the chair can retain or no need to change. For the computer laboratory table, lower the height so that the students may avoid hand muscles pain and the computer keyboard may be use so comfortably and relax.

To use a height adjustable chair or desks for the compatibility of the students with their respective body measurements to the height of chair and table. These also help to prevent the mismatches in seated work. For the future researchers this study can use as basis for their study regarding the workstation of offices and for the chairs in classrooms concerning the anthropometric measurements.

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