How much time do students from DIMEI sleep?

(Mechanical and Industrial Engineering Division)
DIMEI
División de Ingeniería Mecánica e Industrial

Objective

Generate a statistical analysis about how evaluation periods affect the sleep hours of students who are part of DIMEI

Introduction

• **What is DIMEI?**

DIMEI is the Division of Mechanical and Industrial Engineering of the Faculty of Engineering at UNAM (National Autonomous University of Mexico) that seeks to generate in an integral way human resources of excellence in the areas of Mechanical, Industrial, Mechatronic and Biomedical Systems engineering according to the needs of society, committed to the economic development of the country and the sustainable use of natural resources. Although they are part of the same division of the Faculty of Engineering, each area has different study plans and different approaches.

• **Motivation**

Each semester of all DIMEI´s majors is divided into three periods of evaluations. The recommended amount of sleep for a person between 18 and 25 years is from 7 to 9 hours per day, for this reason, a question arose: Do students from DIMEI belonging to this age range really sleep the recommended hours in the first and the last evaluation period?

Source: Sleepfoundation.org. (2019). National Sleep Foundation Recommends New Sleep Times | National Sleep Foundation. [online] Available at: https://www.sleepfoundation.org/press-release/national-sleep-foundation-recommends-new-sleep-times [Accessed 25 Mar. 2019].

Survey

• A web survey was carried out on 146 students belonging to DIMEI

• From industrial engineering, a total of 33 students were surveyed, 36 from Mechanics, 40 from Mechatronics and 37 from Biomedical Systems.

Percentage of students surveyed per career
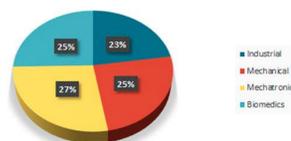
Primary analysis

Do Students from DIMEI that belong to the age range between 18 and 25 years really sleep the recommended 8 hours in the first and the last period of evaluations?

For this question, two cases were made:
1) Sleep hours at the beginning of the semester are equal to the recommended sleep hours.
2) Sleep hours in the third period are equal to the recommended sleep hours.

Comparison of sleep hours at the beginning and at the end of the semester
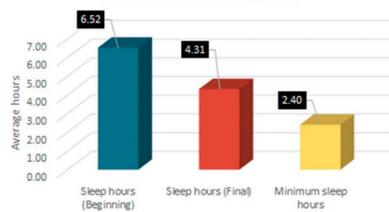
Recommended sleep hours = 8		Number of samples=146		Significance level (1-α)=0.95					
			Statistical hypothesis testing						
Case	Variables	Null hypothesis	Alternative hypothesis	Sample Mean (X,Y)	S^2	Sp	Z	-Z(α/2)	
1	X= Sleep hours at the beginning of the semester	Ho:X=8	Hi:X≠8	6.5240	1.8460	1.3587	-13.1268	-1.96	
2	Y= Sleep hours at the end of the semester	Ho:Y=8	Hi:Y≠8	4.3116	2.4419	1.5626	-28.5199	-1.96	

The average of sleep hours obtained in the survey was used. In both cases, the null hypothesis is rejected because it is in the rejection region.

Secondary analysis

Because both cases are in the rejection region, students at the beginning and at the end of the semester do not sleep the recommended hours. Is there any reason to believe that sleep hours of DIMEI students do not vary according to the evaluation period?

The sample means $\bar{X}$ and $\bar{Y}$ are the general averages of the hours that DIMEI's students sleep during the first and the third evaluation period.

Difference of means									
Variables	n	Sample Mean ($\bar{x},\bar{y}$)	$\bar{x}-\bar{y}$	Sx^2	Sy^2	Sp^2	Sp	Z	1- P(Z<14.6599)
x= Sleep hours at the beginning of the semester	146	6.5240	2.5123	1.8460	2.4419	2.1439	1.4642	14.6599	<0.001
y= Sleep hours at the end of the semester		4.3116							

The final value of P (Z> 14.6599) is calculated with 1-P (Z <14.6599) using the probability tables of normal distribution.

Then, by seeing that the probability of $\bar{X}$ and $\bar{Y}$ for being equal is very small, we can conclude that the hours of sleep varies according to the evaluation period, therefore, students sleep less in the last evaluation period.
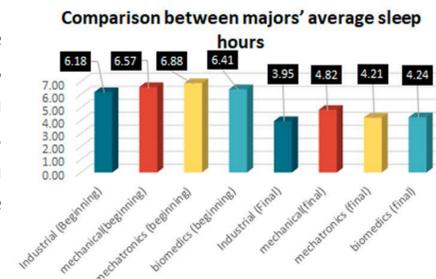
Additional observations

In the graph below we can see how, when DIMEI's men surveyed slept on average more hours than women at the first evaluation period, women actually slept on average more than men at the last evaluation period.

Sleep hours average comparison between women and men
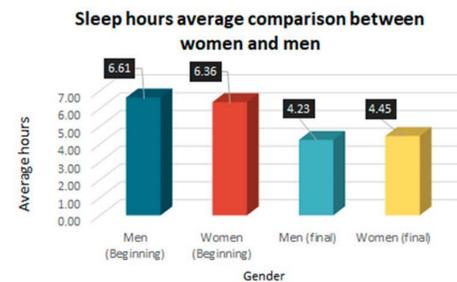
Even so, the difference in sleep hours between men and women is really tiny (less than an hour) in both, the first and the last evaluation period. From this graph, we can conclude that the gender of the students is not a factor that can influence their sleep hours.

In the following graph we can notice how the major that on average sleeps the most at the first evaluation period is mechatronic engineering, but at the last evaluation period, on average the major that sleeps the longest is mechanical engineer.

Nevertheless, Industrial engineering at the first and the last evaluation period on average slept less time.

Comparison between majors' average sleep hours

Additional observations

In the graph on the right, 8% of the students surveyed showed that the main reasons for staying awake were personal reasons and part-time-job. We can deduce from this survey that even when there are different reasons why DIMEI's students cannot sleep, they give more importance to the exams than other reasons mentioned before.
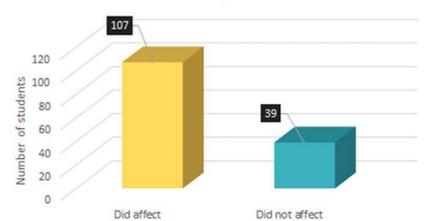
Main reasons for stay awake of students.
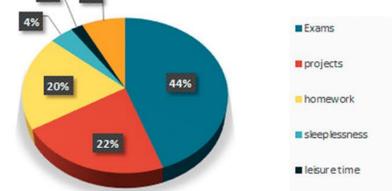
Consumption of coffee, soft drinks, and energy drinks to stay awake
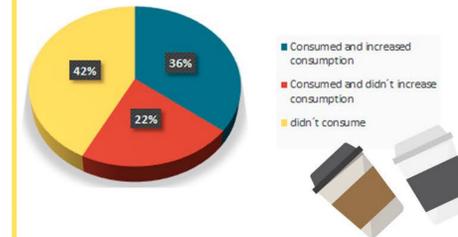
In the following graph, 58% of the DIMEI's students consumed beverages such as coffee, soft drinks, and energy drinks to stay awake. Just less than a half (42%) of DIMEI's students at the evaluation period did not consume these beverages.

In this last graph, we observe the opinion of the students surveyed about the consequences that staying awake has had on their academic performance, 27% of them did not feel affected but the other 73% did.

Students that consider that staying awake affect their academic performance

Conclusions and suggestions

Conclusions.

• Neither in the first nor in the last evaluation period students sleep the hours recommended according to their age range.

• Students of all majors, both women and men, in the last period sleep approximately one third less than what they used to sleep in the first evaluation period.

• According to the survey, we suggest that the three main reasons that keep students awake are exams, projects, and homework.

• A little more than half of the students consume energy drinks and increase their intake throughout the semester.

• We observed in the survey that students consider their academic performance decreased during the semester due to the reduction of their sleep hours.

Suggestions:

For future surveys related to the subject we suggest:

• To add another section to the survey where students and teachers are asked about the actions they recommend to optimize their performance in order to increase the hours of sleep during the semester.

• Increase the number of students surveyed to improve the accuracy of the analysis.