Course Project: The Effects of Sleepiness on College Students

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Question Statement: What is the practical question in the context of the real-world setting?

For college students, sleep is the farthest thing on their minds, yet its importance cannot be overstated. In 2014, the *Journal of Nature and Science of Sleep* published an article called "Causes and Consequences of Sleepiness among College Students" http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4075951/ in which the authors discuss sleep deprivation among college students and its effects on their mood, academics, and driving. Since its finals time right now, I think that this problem is an important one to address, for I am curious on whether amount of sleep really effects the GPA of college students.

Plan: What specific statistical operations does this problem call for?

I designed a questionnaire, which I will give out randomly in 3 of my classes, asking the student's age, gender, GPA, and the usual amount of sleep they get during the weekday. Only 20 people filled out the questionnaire, the data of which is summarized in Table 1.

Table 1: Student's GPA and Hours of Sleep

Student	Gender	Age	GPA	Hours of Sleep
A	M	18	3.80	7
B	F	20	4.00	7
C	M	19	3.95	8
D	M	19	3.60	7
E	M	19	3.50	6
F	F	20	3.00	4
G	F	21	3.20	5
H	F	20	3.60	5
I	F	22	3.70	6
J	F	20	3.70	6
K	M	20	2.75	6
L	F	19	3.75	6
M	M	19	3.50	6
N	F	20	3.80	7
O	F	18	3.00	4
Q	F	19	3.10	4
R	F	20	2.80	5
S	M	20	3.25	5
T	M	20	3.65	6
U	F	20	3.40	8

Solve: Make the graphs and carry out the calculations for this problem.

I would like to know if there is correlation between more sleep and a higher GPA.

Table 2: Product of the Deviations

Student	X_i	Y_i	$X_i - X_{average}$	$Y_i - Y_{average}$	$(X_i - X_{average})(Y_i - Y_{average})$
A	3.80	7	0.35	1.1	0.385
B	4.00	7	0.55	1.1	0.605
C	3.90	8	0.45	2.1	0.945
D	3.60	7	0.15	1.1	0.165
E	3.50	6	0.05	0.1	0.005
F	3.00	4	-0.45	-1.9	0.855
G	3.20	5	-0.25	-0.9	0.225
H	3.60	5	0.15	-0.9	-0.135
I	3.70	6	0.25	0.1	0.025
J	3.70	6	0.25	0.1	0.025
K	2.75	6	-0.70	0.1	-0.07
L	3.75	6	0.30	0.1	0.03
M	3.50	6	0.05	0.1	0.005
N	3.80	7	0.35	1.1	0.385
O	3.00	4	-0.45	-1.9	0.855
Q	3.10	4	-0.35	-1.9	0.665
R	2.80	5	-0.65	-0.9	0.585
S	3.25	5	-0.2	-0.9	0.18
T	3.65	6	0.2	0.1	0.02
U	3.40	8	-0.05	2.1	-0.105
Sum	**69.05**	**118**	**0**	**0**	**5.65**

X_i : GPA

Y_i : Hours of Sleep

$X_{average} = 3.45$

$Y_{average} = 5.9$

$n = 20$

Standard deviation of GPA: $s_X = \sqrt{\frac{\Sigma (X_i - X_{average})^2}{n - 1}} = 0.36$

Standard deviation of Hours of Sleep: $s_Y = \sqrt{\frac{\Sigma (Y_i - Y_{average})^2}{n - 1}} = 1.21$

Correlation:

$$r = \frac{\Sigma (X_i - X_{average})(Y_i - Y_{average})}{(n-1)(s_X s_Y)} = \frac{5.65}{(20-1) \times 0.36 \times 1.21} = 0.68$$

Coefficient of Determination:

$$r^2 = 0.68^2 = 0.47$$

Total Sum of Squares (Measure of total variation):

$$SSTO = 1.21^2 (20-1) = 27.82$$

Residual Sum of Squares (Measure of unexplained variation):

$$SSResid = 27.82 (1 - 0.68^2) = 14.96$$

Because r is positive, it indicates a positive correlation between the GPA and Hours of Sleep for students.

Conclude: Give your practical conclusion in the setting of the rea-world problem.

We can conclude that there is a positive correlation between the GPA of a student and the amount of hours they sleep by using a correlational study.

Because of this, students should be encouraged to get their work done early, relax, and have a good night's rest so they can do the best they can academically.