Statistical Analysis: Homework at IU

The online degree programs are specifically designed for the professional who juggles a career, family and other commitments. Colleges are challenged with the task of designing and supporting a balanced program that fits the busy schedule of the students without sacrificing quality. Prospective students are always concerned if the program would take too much time and interfere with their professional and personal life.

At IU, on average, students are expected to spend about 1.5 hours per day working on assignments. However, after the first 5-6 workshops in Statistical Analysis, I was under the impression that I spend on homework more than 2 hours every day. To test my hypothesis I started recording the actual time I work on assignments. I kept records for 3 consecutive workshops. The results are provided in the table that follows:

Day of Week	Date	Time in Minutes
Tue	7-Dec	90
Wed	8-Dec	180
Thu	9-Dec	200
Fri	10-Dec	140
Sat	11-Dec	120
Sun	12-Dec	150
Mon	13-Dec	60
Tue	14-Dec	30
Wed	15-Dec	40
Thu	16-Dec	180
Fri	17-Dec	120
Sat	18-Dec	75
Sun	19-Dec	310
Mon	20-Dec	60
Tue	4-Jan	60
Wed	5-Jan	60
Thu	6-Jan	240
Fri	7-Jan	320
Sat	8-Jan	120
Sun	9-Jan	200
Mon	10-Jan	45

To analyze the data I used hypothesis testing. This is a procedure that is based on sample evidence and probability theory to determine whether the hypothesis is a reasonable statement. Hypothesis testing is a five-step procedure:

Step 1. State the null and alternative hypotheses. The null hypothesis is a hypothesis about a population parameter. It is often the reverse of what the experimenter actually believes; it is put forward to allow the data to contradict it.

Step 2. Select the level of significance. This is the probability of rejecting the null hypothesis when it is true. It is also sometimes called the level of risk

Step 3. Determine the test statistic.

Step 4. Formulate the decision rule.

Step 5. Select the sample, perform the calculations, and make a decision.

The specific steps for this case are defined below:

Step 1: The null hypothesis is that I spend 2 hours or less on homework. The alternate hypothesis is that I spend more than 2 hours on homework.

H_0: $\mu \leq 120$ min.

H_1: $\mu > 120$ min.

Step 2: Traditionally, the .05 level is selected for consumer research projects.

$\alpha = .05$

Step 3: The *t* distribution is the test statistic for a population with unknown standard deviation and when there are fewer than 30 observations.

Step 4: This is a one-tailed test with 20 degrees of freedom, found by n-1=21-1=20. The critical $t = 1.725$. Therefore, the null hypothesis will be rejected if the value of t is greater than 1.725

Step 5: For the calculations I used the MegaStat software. The results are provided below:

Hypothesis Test: Mean vs. Hypothesized Value

120.000	hypothesized value
133.333	mean minutes
85.298	std. dev.
18.614	std. error
21	N
20	Df
0.72	T
.2410	p-value (one-tailed)

The results show that the computed t-value (0.72) is less than the critical value (1.725). Also, the p-value (.24) is greater than the significance value (.05). I cannot reject the null hypothesis. There is not sufficient proof that I spend more than 2 hours on homework every day. Based on this conclusion I would recommend this form of education to colleagues and friends. With good time management and self discipline professionals should be able to successfully participate in a quality online degree program.

Next, I tested if the program is well balanced. I wanted to see if I am equally busy throughout the week. For the analysis of the data I used the Analysis of Variance (ANOVA) technique. ANOVA tests simultaneously whether the means of several populations are equal. By simultaneously testing all populations, error buildup is avoided. The ANOVA test follows the standard five-step hypothesis testing procedure too.

Step 1: The null hypothesis is that there is no difference between the mean numbers of hours I study every day of the week. The alternate hypothesis is that the means are not all the same for the seven days of the week.

H_0: $\mu_{Mo} = \mu_{Tu} = \mu_{We} = \mu_{Th} = \mu_{Fr} = \mu_{Sa} = \mu_{Su}$

H_1: The means are not equal

Step 2: I use again the .05 level of significance.

Step 3: The *F* distribution is the test statistic for ANOVA tests. The *F* distribution is the distribution of the ratio of two estimates of variance. It is used to compute probability values in ANOVA.

Step 4: *F* has two parameters: degrees of freedom in the numerator (dfn) and degrees of freedom in the denominator (dfd). The dfn is the number of degrees of freedom that the estimate of variance used in the numerator is based on. The dfd is the number of degrees of freedom that the estimate used in the denominator is based on.

dfn = number of treatments – 1 = 7 days – 1 = 6

dfd = total number of observations – number of treatments = 21 – 7 = 14

The critical value for *F* is 2.85. So, the decision rule is to reject the null hypothesis if the computed value of *F* exceeds 2.85.

Step 5: To be able to use the MegaStat software for the calculations I organized the data in the following table:

Mon	Tue	Wed	Thu	Fri	Sat	Sun
45	90	180	200	140	120	150
60	30	40	180	120	75	310
60	60	60	240	320	120	200

The results are presented in the two tables below:

One factor ANOVA

Mean	*n*	*Std. Dev*	
55.000	3	8.66	Mon
60.000	3	30.00	Tue
93.333	3	75.72	Wed
206.667	3	30.55	Thu
193.333	3	110.15	Fri
105.000	3	25.98	Sat
220.000	3	81.85	Sun
133.333	21	85.30	Total

ANOVA table

Source	*SS*	*df*	*MS*	*F*	*p-value*
Treatment	91,216.67	6	15,202.778	3.92	.0165
Error	54,300.00	14	3,878.571		
Total	145,516.67	20			

The computed value of *F* (3.92) is greater than the critical value of *F* (2.85). Also, the p-value (.0165) is smaller than the level of significance (.05). I have to reject the null hypothesis. At the .05 level of significance there is a difference in the number of hours I study every day. The *Post hoc* analysis shows that on Thursdays and Sundays I spend more time on assignments than on Mondays and Tuesdays. The time I study on Saturdays differs from the time I study on Mondays and Thursdays. The details of the *Post hoc* analysis are provided in the table below:

		Mon 55	Tue 60	Wed 93	Sat 105	Fri 193	Thu 207	Sun 220
Mon	55							

Tue	60	.7953						
Wed	93	.4328	.5175					
Sat	105	.0341	.1210	.8132				
Fri	193	.0960	.1131	.2648	.2478			
Thu	207	.0012	.0040	.0740	.0118	.8498		
Sun	220	.0255	.0336	.1205	.0812	.7534	.8046	

The results show that I work longer on some days of the week. On such days most likely I use the Blackboard system more, call help desk if need be, and write the facilitator with questions. The implication this has on IU is that its staff and equipment have to be prepared and able to meet students' increased needs for support. This applies to class facilitations, help desk support, and administration. Before taking any specific measures, however, I would recommend that IU conducts a more extensive analysis that applies proper sampling techniques and more precise measuring tools.