Statistics 101: Group Project

Statistics is about variation. By carefully collecting and analyzing data, we are able to better understand and explain variation. This project is intended to give you first hand experience in using the ideas presented so far in Stat 101 to collect and perform a preliminary analysis of data. This is a group project. You are required to work in a group with no more than 5 people. All members of your group are equally responsible for the project and all members will receive the same grade on this assignment.

The focus of this project is on designing an experiment, describing variation and using correlation and regression to explain variation in the resulting data. You should choose a topic from the list below. Once you have chosen a topic you should:

1. Answer the questions Who? for your topic.
2. Answer the question What? for your topic by identifying a quantitative (numerical) explanatory variable and a quantitative (numerical) response variable.
3. Phrase a hypothesis about the relationship between your explanatory variable and your response variable. For example, in Lab #6 you might hypothesize that the higher the drop height the greater the number of bounces for the tennis ball.
4. Identify at least 5 levels of the explanatory variable (factor) that you will manipulate in the experiment.
5. Decide how you are going to design an experiment to investigate your conjecture. You should think about the ideas presented in Chapter 13. You must decide how to incorporate control, randomization, and replication in your experiment. When designing your experiment, keep in mind the ideas from the Grading Rubric for Design of Experiments from Lab # 6. (You can find a copy of this rubric on the course web page.)
6. Run the experiment and collect the data. You must have a minimum of 30 data points (rows in your JMP table).
7. Analyze your data. You must use JMP to construct plots and do the calculations. Use methods from Chapters 4 and 5 and Chapters 7 through 9 that are appropriate. Remember, the focus of the analysis is on describing and understanding variation and on using correlation and regression to explain variation. Use previous homework assignments for information about inputting data into JMP and running distribution and regression analyses. Turning in JMP output is not enough.
   You must interpret the results of any analysis you do.
8. Write a final report. Your report should include sections on:
   a. your hypothesis including the explanatory variable (factor) and response variable.
   b. the design of your experiment. Be very specific on how you collected your data. Use the Lab # 6 rubric to make sure you have designed your experiment appropriately.
   c. the data (include a copy of your data).
   d. the statistical analysis and its interpretation.
   e. your conclusion stating what you have learned about your hypothesis from your data.

A major goal of this assignment is to give you an appreciation for obtaining useful data. Use the ideas of Chapter 13: Experiments to assure that your data are reliable and accurate.

Possible Topics:

- The strength of paper towels.
- Flight of paper airplanes or paper helicopters.
- Quality of microwave popcorn.
- Time to boil water.
- Distance a golf ball rolls.
- Quality of batteries.
Grades will be determined on:

1. How well you used the ideas of Chapter 13 to collect your data. \[20 \text{ pts}\]
2. Relevance and completeness of the analysis of the data including appropriateness of your conclusions. \[20 \text{ pts}\]
3. Clarity of the final report. \[5 \text{ pts}\]
4. Adherence to guidelines and deadlines provided in this handout and any oral instructions given in class. \[5 \text{ pts}\]

**Time table:** You may submit work anytime **on or before** the listed dates. Submissions after the dates listed below will result in deductions from your project score.

- **The end of lab period the week of March 19:** Groups formed. Each group should turn in a sheet of paper with names of the group members and the topic chosen. Also, on this sheet answer the questions Who? and What?, identify the explanatory and response variables and formulate a hypothesis about their relationship.

- **The end of lab period the week of March 26:** Groups should turn in a detailed description of how they will collect their data. This should include: the factor levels (treatments), the outside variables that will be controlled and how they will be controlled, how replication will be incorporated in the experiment, and how randomization will be used. A data collection sheet with a randomized order of runs should be submitted as well.

- **By 5 pm, April 6:** Data collection completed. A copy of the data must be submitted and no changes to the data can be made after submission. Data should be submitted by attaching a JMP data table as an attachment to an email to your course instructor. You will **NOT** get this copy back so make sure you have a copy for your group.

- **By 5 pm, April 13:** Final report due. Submit only one report per group. Reports will **NOT** be returned. Each group member will receive a critique of the project and a project score.

**Guidelines:** Work submitted for this project must follow the guidelines below. Failure to follow these guidelines will result in deductions from your project score.

- All work submitted for this project must include the names of all group members.
- Final reports must be printed using either an ink-jet or laser printer.
- The final report must be written in the same manner as a term paper. The report should contain sections, paragraphs, complete sentences, and **NO** misspelled words. You should divide your report into sections, making sure to clearly label these sections.
- All graphs and plots must be computer generated. Hand-drawn plots or graphs **will not be accepted**. Use the information from previous homework assignments to create and print graphs using the computer program JMP. JMP output can be saved in a format compatible with WORD. To do this, go to the **Edit → Journal** menu in JMP. Save the output by going to the **File → Save as** menu in JMP and selecting the Save as type: RTF Files. RTF files can be opened by WORD. Additionally, you can COPY/PASTE any JMP output into WORD.