**AP STATISTICS: FINAL RESEARCH PROJECT**

**Overview:**

*Your final research project in statistics will give you the opportunity to synthesize everything that you have learned in this class into a final project. You may work by yourself or with one other partner. Think of this assignment like an abridged senior thesis in college. I think that you will find that the through this process, you will gain a deeper understanding of designing an experiment or survey, collecting and analyzing data, and reporting your results in a professional manner. You will be collecting data on a topic of your choice (that must be approved by me). Your final product will include an abstract, intro, method, results and conclusion. It will include visual displays, descriptive statistics, confidence intervals, and significance tests.*

*We will be displaying our final projects in Alumni Hall on* ***Friday, May 2nd*** *during 7th period and again during CAP. We will be blowing up your projects on large paper to be displayed in Alumni Hall. You will have the opportunity to stand in front of your projects and discuss your research with your classmates, teachers, and peers when the assignment is done. Amanda and I will also be selecting projects to be recipients of the AP Statistics Research Prize!!*

**Components of the Project:**

Below is an overview of the components that will be included in your final paper. I will provide you with some journal articles (and samples) so that you can get a general idea of what a published version of this looks like. Keep in mind that our experiments, background research etc. for our projects obviously have much smaller scope then the sample journal articles, however, the overall process remains the same. I will be providing more information about specific components must be included for each section. You will be submitting a final paper and poster for your final product.

*Title/Authors; Table of Contents; Abstract; Introduction; Method; Results; Conclusion; Appendix*

***Project Outline***

*Part 1: Identify a Research Question and Design Your Study*

*Part 2: Collect Data – Observational Study or Experiment*

*Part 3: Analyze Data – Graphically and Numerically*

*Part 4: Perform Inference – Answer Research Question*

*Part 5: Present Findings (Write your Paper)*

*Part 6: Peer Editing*

*Part 7: Present Your Findings (Poster Day)*

**Part 1: Decide on a Research Question and Design Your Study**

At this point, you must decide on a project topic. Your topic should be focused on a particular theme (for example: recycling at Moses Brown, homework, lunch satisfaction, rebounds translate to wins, etc.) or on an experiment with a particular topic of interest (do incentives improve math scores? Does listening to music help while studying?)

**Design your Study - Method**

If you are using a survey, you must carefully determine what questions you want to ask (without introducing bias), how you are going to collect the data (use a Google form NOT Survey Monkey, if you will be collecting data via the web), and how you will analyze the data (i.e. what are you looking to find through your research?). You don’t need too many questions (5-7 questions is probably sufficient, though you should think about collecting some basic information on participants like sex, grade, etc.).

If your project is an experiment, you must design your experiment. You must pay careful attention to detail to design an effective experiment or survey. Start by thinking about what you are trying to prove through your research. How can you effectively (yet simply) determine if there is a treatment effect?

How will you select participants? How will you randomly assign participants to groups? What is the treatment and what is the control group? How can you ensure that you hold all other factors constant so that you can examine the treatment effect? Etc.

Remember, this is NOT a senior thesis. Keep your experiment simple enough. It is difficult enough to collect good data from enough participants to see a statistically significant effect. The best studies are often very simple in design.

**Part 2: Collect your Data – Observational Study or Experiment**

Before you collect your data, come up with some hypotheses about you are expecting to find. Write these down. Now go collect your data. If you are doing a survey, this might be as simple as sending an email to the MB listserve. If you are doing an experiment, you will need to select participants, randomly assign them to groups, and conduct your study. If you are getting data already collected, you might just need to go online (sports websites, census, etc.)

You should enter your data into an excel sheet (that I will collect). If you are doing a survey, a google form will collect your results for you and output them into a spreadsheet (survey monkey won’t do this!)

Questions must be approved before collecting data!!

**Part 3: Analyze your Data – Graphically and Numerically**

Here comes the fun part. This is where all your hard work comes to fruition.

Start with descriptive statistics (means, standard deviations, sample proportions, etc.) and visual displays (boxplots, circle graphs, histograms, etc.). Graphs should have axes labeled and appropriate titles. You don’t want to display everything that you find (only what you find interesting and relevant to your study- be selective).

**Part 4: Perform Inference to Answer your Research Question**

Next you will be reporting confidence intervals and hypothesis tests around your data (let’s stick with 95% Confidence Intervals and α=0.05 for significance levels).

**Part 5: Writing/Displaying your Information**

Finally, you will be writing your paper based on your results. More details to come for each section.

**Part 6: Formatting and Peer Review**

Before blowing up your results onto large paper, we will first do some peer editing to ensure that the paper can easily be deciphered by a peer, and you will have the opportunity to critique each other’s work. You will also be designing the layout of your project.

**Part 7: Display Your Findings (Poster Session)**

You will be displaying your findings in front of your peers during a poster session in Alumni Hall. This will give you the opportunity to discuss your findings verbally and display your hard work.

***INITIAL DEADLINES (more to come after Spring Break):***

***Assignment 1*** *– Due Friday, March 7th – Project Proposals are due for Peer/Teacher Review (1 page) – Bring a rough draft on Thursday, March 6th for peer editing/review. I will get back to you on Monday, March 10th about whether your project is approved. See below for assignment.*

***Assignment 2****- Due Friday, April 4th: Raw Data Collected and Described (see last page).*

**Assignment 1: (Due Friday, March 7th) Project Proposal - Research Question**

You must type your responses. Peer edited on Thursday, March 6th.

Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1.) Research Question: What do you intend to answer through this project? What are your parameter(s) of interest?

3.) Proposed Data Collection (this could be part of your method if done well): How will you go about collecting your data? Be specific. Experiment? Survey? Observational Study?  How will you select your sample? What supplies will you need? If you are doing an experiment, describe your experiment below.

4.) Survey Questions: If you are collecting data using a survey, paste a link to your survey that you created using a Google form.

Teacher Approval:

 \_\_\_\_\_\_\_\_: OK - Begin your data collection

 \_\_\_\_\_\_\_\_: Not OK - Resubmit for approval.

***Assignment 2- Friday, April 4th: Raw Data Collected and Described (see next page).***

*(Part 2 and Part 3 are completed). You must submit your data in Excel format (emailed to Mr. Young –* *byoung15@gmail.com**). Don’t leave data collection until the last minute. You will also compute descriptive statistics and visual display (see assignment below for details).*

**(Example is online)**

First email your data to Mr. Young.

Next, your task for this assignment is to use what you learned in Chapters 1, 3 and 4 to simply describe your sample. In later assignments you’ll use inference to make conclusions about your population, but for now I just want you to describe your sample (though if you want to start doing confidence intervals and hypothesis tests, you may certainly do so, as you will need to at a later time). The work you do in this assignment will become part of your *RESULTS* section of your final abstract and poster. For this assignment you must do the following:

1. Describe overall sample information: How much data did you attempt to collect (for those of you who sent out a set number of surveys)? How much data did you collect? How much data will use use? (For some of you, these numbers will not be the same and you should discuss why you are choosing to not use some of your data. For those of you in this situation, you should report the percent of usable data.)
2. Describe a total of 5 variables (if applicable):
	1. at least 1 variable must be quantitative: include center, shape and spread.
	2. at least 1 variable must be categorical.
3. Describe at least one relationship between two of the variables:
	1. If they are both quantitative do a scatterplot and comment on:
		1. Shape, strength, direction
		2. If linear, regression line slope and interpretation
		3. Fit of regression line (i.e. residuals).
	2. If they are both categorical, make a 2x2 table and comment on conditional percentages.
	3. If one is categorical and one is quantitative, come up with a way to summarize the data both visually and numerically (side by side boxplots, stacked histograms, etc.)
4. Create a total of at least 4 visuals (tables or graphs):
	1. at least one visual must be a table (descriptive statistics, regression output, etc).
	2. at least one visual must be a graph.

To summarize and submit all of this work you must make a statistical report (see example on my website). The statistical report should be organized as follows:

1. Title Page (start to think about what the title of your project will be)
2. Table of contents page (this should list your abstract (see next step) first, followed by each of your visuals (give each a name and make sure they are labeled).
3. Abstract: A one paragraph to one page (MAX!) summary of all of your work. This should be a logical flow of information about your sample. It’s as if you’re telling a numerical story about your sample. Anything you have that doesn’t fit in a visual should be put in the abstract. You can also mention highlights from the visuals so the reader has the motivation to go look at your visuals.