AP Statistics

Final Project(2016)

This is a 5 part project that combines all that you have learned this year in AP Statistics and applies it to a real life statistical experiment/study of your choice.

Part 1 introduces your “burning question”.

Part 2 is the design of your study/experiment.

Part 3 is collecting/mining for data and exploring it.

Part 4 is analysis/inference of the data.

Part 5 is your presentation to the whole class and will replace your final exam.

Each part requires that you submit some double spaced document, font size 12 which you will *save* and hand in at the end as ONE BIG DOCUMENT. You will work in groups of 3 or 4. My suggestion is to have the project saved on several drives or locations in case someone is absent.

**This is the culmination of all that you have learned this year and I hold your effort in high regard.**

**PART 1 – Abstract and Title Page Checklist**

* 1. Brainstorm – Discuss with your group an idea for a study (survey) or experiment that is poignant and interesting for the real lives of high school students at SHS. Please keep these questions in mind while brainstorming:

1. What overall concept does your group want to learn about for SHS?
2. What variables will be able to measure the concept you have decided upon?
3. Will you measure the variables quantitatively (means), categorically (proportions), or both?
4. Do you want to look at the relationship between two variables (regression or chi-square)?
5. What are your hypotheses or “gut feelings” about the concept or variables?
6. What basic graphical and numerical analysis will you perform?
7. What inferences you will perform?
8. How will you collect the real data (study or experiment) or will you mine for existing data?
9. Basic information about your sample like sample design and sample size
10. Is your design feasible?

**Sometimes it helps to start with a hypothesis test and/or confidence interval and work backwards!**

* 2. Approval - Once you have decided upon your overall idea, run it by me for advice and suggestions to fine tune your ideas. Do not proceed until you have approval!
* 3. Title Page – Now you may begin typing and saving your document. The first page should include full names of all students in your group, period, year, my name, and of course in the middle of the page in big letters the title of your experiment/study. Make it cool!
* 4. Abstract – This will immediately follow the title page. Type in font size 12. An abstract is a brief description to introduce your statistical experiment or observational study to the reader. Typically an abstract has many pages in a real academic paper but for our class it will only be 4 or 5 paragraphs and no more than 2 pages. It includes:

1. A paragraph or two describing the well developed concept or “burning question” that your group decided upon to investigate. This is the time to introduce your topic while “hooking” in your reader
2. Your hypotheses about what the outcome of your study/experiment will be. This is a great time to write about your null and alternative hypotheses for the hypothesis test(s).
3. A paragraph or two providing a background summary or any previous knowledge related to your topic and/or your own personal beliefs on the topic. This may require some minor research. It’s called Google folks. It’s OK if there are no previous studies or research on your topic just make sure you interject your group’s beliefs, norms, and/or values about the topic.
4. One paragraph in the abstract should define:

* Your variables and whether they are being measured quantitatively, categorically, or both
* The basic graphical and numerical analysis you plan to perform and why
* Your population and parameters used to describe it
* Your sample and statistics used to describe it
* What type of hypothesis test and confidence intervals you will perform and their purpose

1. The last paragraph should be about anticipated issues and challenges with the study/experiment. This is a great time to talk about suspected biases or errors that may plague your future results.

**DO NOT START COLLECTING DATA UNTIL YOU HAVE COMPLETED PART 2!!!**

**PART 2 – Design Of Your Sample and Study/Experiment**

* 5. Sample Design - Now that you have introduced your overall idea, it’s time to break it down and get specific. The first thing to do is decide how you will obtain your data and it starts with choosing your sample. Write a paragraph about your sample design. Here are your choices:

1. If you’re a doing a survey or experiment involving SHS students the best thing to do would be a stratified or SRS design but that may be impossible. BOO-HOO! If you are doing a survey your best bets are to use the cafeteria, atrium or library etc. as cluster/convenience/ systematic samples. If you are doing an experiment you can use the same spots and sample designs for your volunteers. All of these locations and designs have issues and you must mention that in part 7.
2. If you are mining for data there are an infinite number of sources for data, especially on the internet. Some sources are better than others. ESPN.com is probably going to give you better sports data than Art McGillicuddy’s Sports Facts.com. Make sure you check your sources before going forward.

* 6. Study/Experimental Design - A written description of your observational study or statistical experiment design. It should include the exact process the experimenter will have to follow **so that someone could replicate the exact experiment or study**. It must be very detailed about time, place, process, materials, sources, and etc. A list of steps is acceptable here but you must also provide:
  1. The actual survey if you are doing an observational study.
  2. The diagram of your experiment along with a description of how you plan to randomly assign treatment groups and forms of control.
  3. If you are doing an observational study using previously collected/mined data you should mention how you plan to use it to answer your question and the source of your data.

**NOW YOU CAN GO OUT AND COLLECT YOUR DATA!!!**

**PART 3 – Collecting Data and Basic Graphical and Numerical Analysis**

* 7. Collect Your Data – Write a paragraph about how the data collection process went. Talk about the issues/difficulties/challenges you encountered during the data collection process and any new biases or errors that might have taken place. **Please hand in your actual data!**
* 8. Basic Graphical Analysis –The amount of graphs you need to do are up to you, but it might be helpful to re-read the abstract to make sure that you show enough graphs to prove your point or show something interesting. Your options are:

1. If you have quantitative data – histograms, boxplots, dotplots, line graphs (timeplot), all comparative plots, normal probability plots, scatterplots (regression only), and/or residual plots.
2. If you have categorical data – 2 way table, bar chart, comparative bar chart, and/or segmented bar chart.

* 9. Basic Numerical Analysis – The next thing we did after graphical analysis of data was numerical analysis. The amount of statistics or numerical descriptors you need are up to you, but it might be helpful to re-read the abstract to make sure that you do enough to prove your point or show something interesting. Your options are:

1. If you have quantitative data – center of a distribution (mean or median), spread of a distribution (standard deviation, IQR, range), regression equation along with r, r-squared, slope and intercept.
2. If you have categorical data – many different types of percents or proportions

**PART 4 – INFERENCE AND SYNTHESIS/CONCLUSION**

* 10. Inference - This is the part where you **try** to answer your “burning question” or check your hypotheses from the abstract using significance test’s, confidence intervals, linear regression t-tests/intervals, , or any other method for analysis. Remember you don’t necessarily have to find something significant here or confirm your alternative hypothesis. Sometimes finding nothing or contradictory results are just as important. Remember, don’t overstep your bounds and say that you have proved something unequivocally and be honest by providing a caveat if necessary.

**YOU ARE EXPECTED TO DO SEVERAL TYPES OF INFERENCE, NOT JUST ONE!**

* 11. Synthesis/Conclusion – This is THE MOST IMPORTANT paragraph or two that synthesizes all the information from the study. It sums up your overall idea and hypotheses, the design of your sample and study/experiment, data collection, basic analysis, and inference. The idea here is not to talk about every single thing you did or found, but only mention the important and “punchy” results in context. Think of the man from Pennsyltucky.

**PART 5 – PRESENTATION AND BLURB**

* 12. Presentation – On the last day of class everyone in your group will take turns speaking to the rest of the class. You will sum up your project discussing your overall topic, hypotheses, type of tests used, sample design, experimental/study design, anecdotes from data collection, results from the data, p-values, and overall conclusions.
* 13. Blurb – A blurb is a one page document that has the title of your project and everyone in your group’s name on it. It must also have one paragraph that sums your whole project up. MAKE IT FLASHY! Your synthesis/conclusion is a great source for this document. THIS DOCUMENT IS NOT ATTACHED TO THE FINAL PROJECT, BUT HANDED IN SEPARATELY!

**PREVIOUS RESEARCH TOPICS**

* Do students learn better on a quiet room or a room with music?
* Personal space… how close is too close?
* Do girls or boys use more tape when wrapping presents?
* Which brand of paper towels is best?
* Which golf ball travels the farthest?
* Do men prefer different colors than women?
* Are there really over 1000 chips in every bag of Chip Ahoys?
* Is the team performance of the Portland Trailblazers consistent with an average NBA team?
* Does coaching improve SAT or ACT scores?
* Do states with capital punishment have a lower homicide rate than those states without?
* Are there any factors that can predict the success or failure of a marriage?
* Do glasses make people look smart?
* Do people tend to enter into professions that are like what their parents did?
* How do people choose who they will become friends with in high school or college?
* What best predicts whether high school friends will keep in close touch 10 years after graduation?
* Are men drivers worse than women drivers?
* What is the difference in degrees of jealousy between males and females?
* What can help determine the number of close friends a person has?
* What personal characteristic has the strongest relationship with marijuana usage?
* What are the differences in the way students perceive themselves as opposed to the way teachers perceive them?
* When choosing a boyfriend/girlfriend, what’s more important to boys and girls - personality or appearance?