

STATISTICS ACTIVITIES: UTILIZING THE FEATURES OF STATCRUNCH

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Abstract

This paper is designed to demonstrate StatCrunch's ability to "collect, crunch, and communicate," (Pearson, 2017) and to show how the Survey and Report tools are used for a data project in an introductory statistics course. Examples of student work are included, as well as an example of the data project used in the Fall 2017 semester.

Introduction

The activities in this paper are adapted from Sullivan & Woodbury's Interactive Statistics: Informed Decisions Using Data (Pearson, 2016) and are used in a current Introduction to Statistics course. The interactive activities allow students to engage with tasks that focus on recommendations from the Guidelines for Assessment and Instruction in Statistics Education (GAISE) College Report (2016). These recommendations include collecting real-life data, using technology to explore and analyze data, and sharing results.

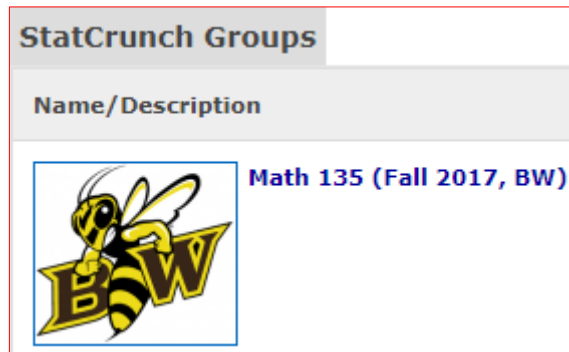
The following is an example of a project that was initially used in the Fall 2016 semester, and updated over the following two semesters. In this project, students submit a proposal for their idea, and design an individual survey using the StatCrunch Survey tool to collect data that is of interest to them. Once the data are collected, they are explored and analyzed using StatCrunch. Each student's results are presented in a StatCrunch Report and eventually shared with class members once the data projects have been graded. Sharing of data in this manner promotes learning and discussions among students (West, 2009). After describing the project details, we also provide "lessons learned" over the course of the three semesters the project has been utilized. All tutorials for using the Survey and Report tools can be found at the StatCrunch site, are uploaded to our course BlackBoard site and can be found in the [StatCrunch YouTube playlist](#).

StatCrunch Groups

At the beginning of the semester, students join the StatCrunch Group for our class. This group feature easily allows instructors to provide students with the data used in class.

Students also use the group to collaborate and share analyses when completing group activities.

Figure 1: Joining a StatCrunch Group.



Data Project

During the semester, [the project](#) is introduced and assigned after students have done basic calculations and graph constructions using StatCrunch.

The Data Project consists of three parts: i.) Proposal, ii.) Survey, and iii.) Analysis and Report

Part I: Proposal (“Question Ideas”) for Collecting Data

Students need to submit the questions they will use in their survey to collect the three data sets needed for the project. These data sets are:

Data Set #1 (qualitative)

Data Set #2 (quantitative – univariate)

Data Set #3 (quantitative – bivariate) Data from these two variables are used to determine if a possible relationship exists between the two variables. Therefore, the data used (and the questions used to obtain the data) should suggest a possible relationship.

Note:

- ✓ All data sets need to contain at least 50 values;
- ✓ Binary data (e.g., yes/no; male/female) are not acceptable;
- ✓ Examples of data previously used in class are not acceptable.

Survey questions are either Multiple Choice or Fill-in-the-Blank (at least one of the questions needs to be a Fill-in-the-Blank question). Part I of the project is submitted in a Word Document via an assignment link on BlackBoard. This first part needs to be approved by the instructor before students may proceed to Part II of the project. This is important for many reasons: it alleviates the possibility of a student not using the correct data set (i.e., qualitative versus quantitative), and it ensures questions are written in a way that will not lead to “messy” data (e.g., data with labels). Furthermore, it lessens the risk of a student trying to “force” quantitative data into qualitative categories when attempting to make a multiple-choice question. As a model for students, an [example of survey](#)

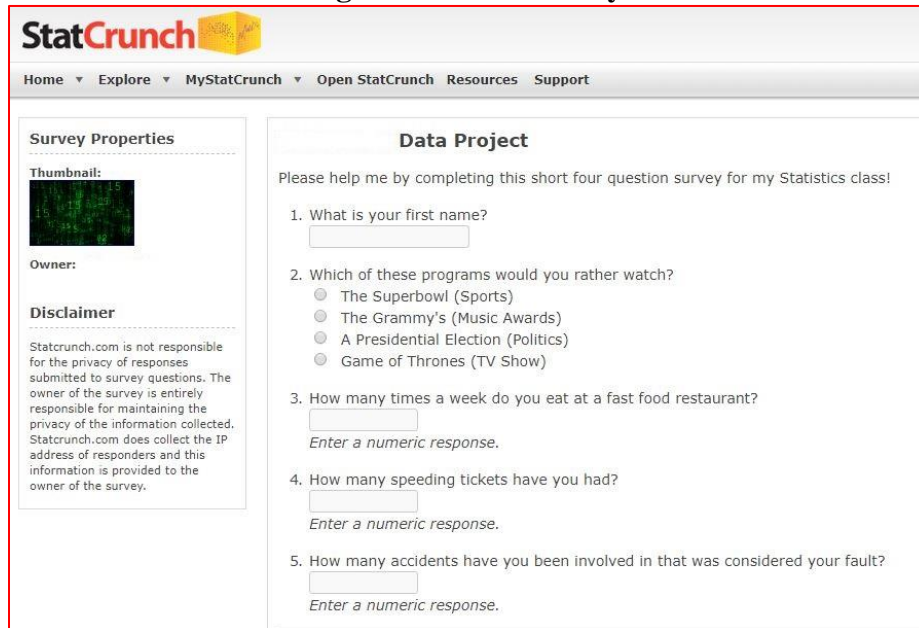
[questions](#) designed by the instructor is provided. These questions are based on a student questionnaire completed at the beginning of the semester.

Part II: Design and Distribution of StatCrunch Survey

Note: The following student work can be enlarged by clicking on each figure.

Students use their approved questions and the Survey tool for the second part of the project. Below are examples of two student surveys:

Figure 2: Bob's Survey.



The screenshot shows a StatCrunch survey interface. The top navigation bar includes 'Home', 'Explore', 'MyStatCrunch', 'Open StatCrunch', 'Resources', and 'Support'. The survey is titled 'Data Project' and includes a 'Survey Properties' sidebar with a thumbnail image, an owner name, and a disclaimer. The main content area contains five questions:

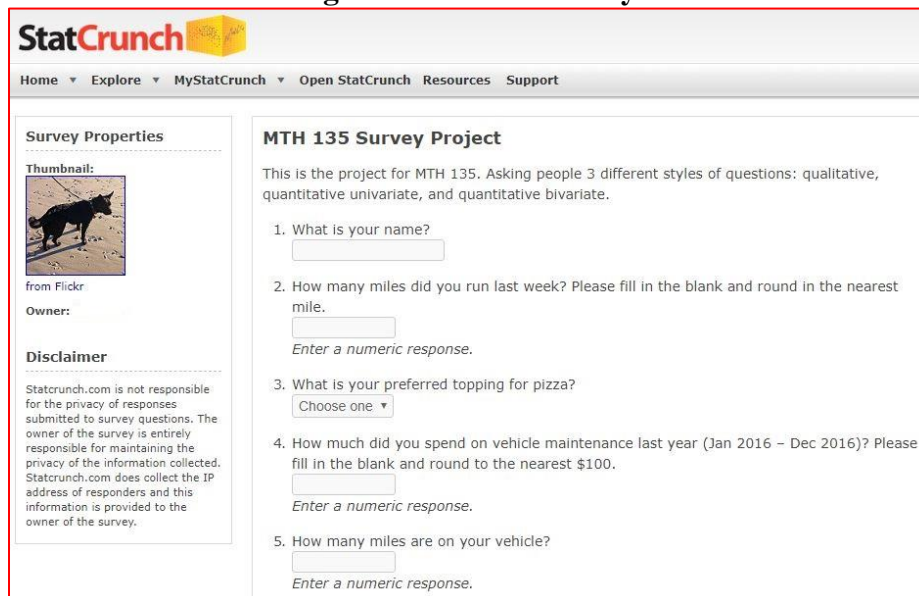
1. What is your first name?
2. Which of these programs would you rather watch?
 - The Superbowl (Sports)
 - The Grammy's (Music Awards)
 - A Presidential Election (Politics)
 - Game of Thrones (TV Show)
3. How many times a week do you eat at a fast food restaurant?

Enter a numeric response.
4. How many speeding tickets have you had?

Enter a numeric response.
5. How many accidents have you been involved in that was considered your fault?

Enter a numeric response.

Figure 3: Annie's Survey.



The screenshot shows a StatCrunch survey interface. The top navigation bar includes 'Home', 'Explore', 'MyStatCrunch', 'Open StatCrunch', 'Resources', and 'Support'. The survey is titled 'MTH 135 Survey Project' and includes a 'Survey Properties' sidebar with a thumbnail image of a dog, a source attribution 'from Flickr', an owner name, and a disclaimer. The main content area contains five questions:

1. What is your name?
2. How many miles did you run last week? Please fill in the blank and round in the nearest mile.

Enter a numeric response.
3. What is your preferred topping for pizza?
4. How much did you spend on vehicle maintenance last year (Jan 2016 - Dec 2016)? Please fill in the blank and round to the nearest \$100.

Enter a numeric response.
5. How many miles are on your vehicle?

Enter a numeric response.

Once a student has completed all question editing, the survey needs to be set to “Open for responses,” and the survey URL is uploaded to the project assignment link on the class BlackBoard site to allow easy access for the instructor. Since many students choose to share the survey link via Facebook or Twitter, the survey is shared “with everyone” so non-users of StatCrunch can also complete the survey. In addition, the survey is shared with our class’ StatCrunch Group, which allows class members to participate in others’ surveys.

Figure 4: Finalizing the Survey.

Survey information

Name:
Math 135 Data Project

Status:
 Closed to responses - Keep survey closed while adding questions!
 Open for responses ←

Submissions:
 Allow multiple submissions from the same respondent
 Display summary results after submissions

Share with everyone (via the Explore menu) when open:
Do not use this option if you want to target a specific audience with your survey.
 No
 Yes

Share with groups:
 Math 135 (Fall 2017, BW)

Part III: Data Analysis and the StatCrunch Report

After all survey responses have been collected, the data is analyzed as follows and included in the StatCrunch Report.

Data set #1 (qualitative) is used to create a bar graph from the raw data, and a frequency table and pie chart from the summary data. Students provide a brief description of their data and save the graphs and results to include in their report.

Data Set #2 (quantitative-univariate) is used for statistical calculations as well as for constructing a frequency table, histogram, and boxplot. Again, students are asked to describe their data in terms of outliers and an approximate distribution.

Data Set #3 (quantitative-bivariate) is used to construct and explore a scatterplot and calculate the correlation coefficient to determine if a possible relationship exists between the two variables. If a relationship potentially exists, the regression equation is calculated and a prediction is made within the scope of the data. Students are asked to explain any possible lurking variables which may affect the relationship.

Figure 5: Bob's Data in Report.

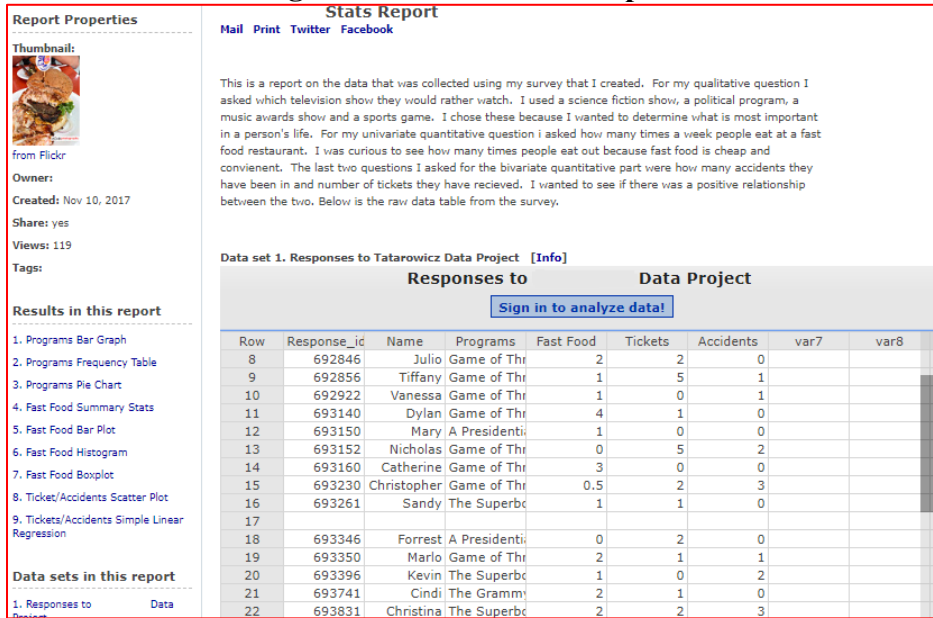


Figure 6: Bob's Qualitative Data Set #1 (Partial Report).

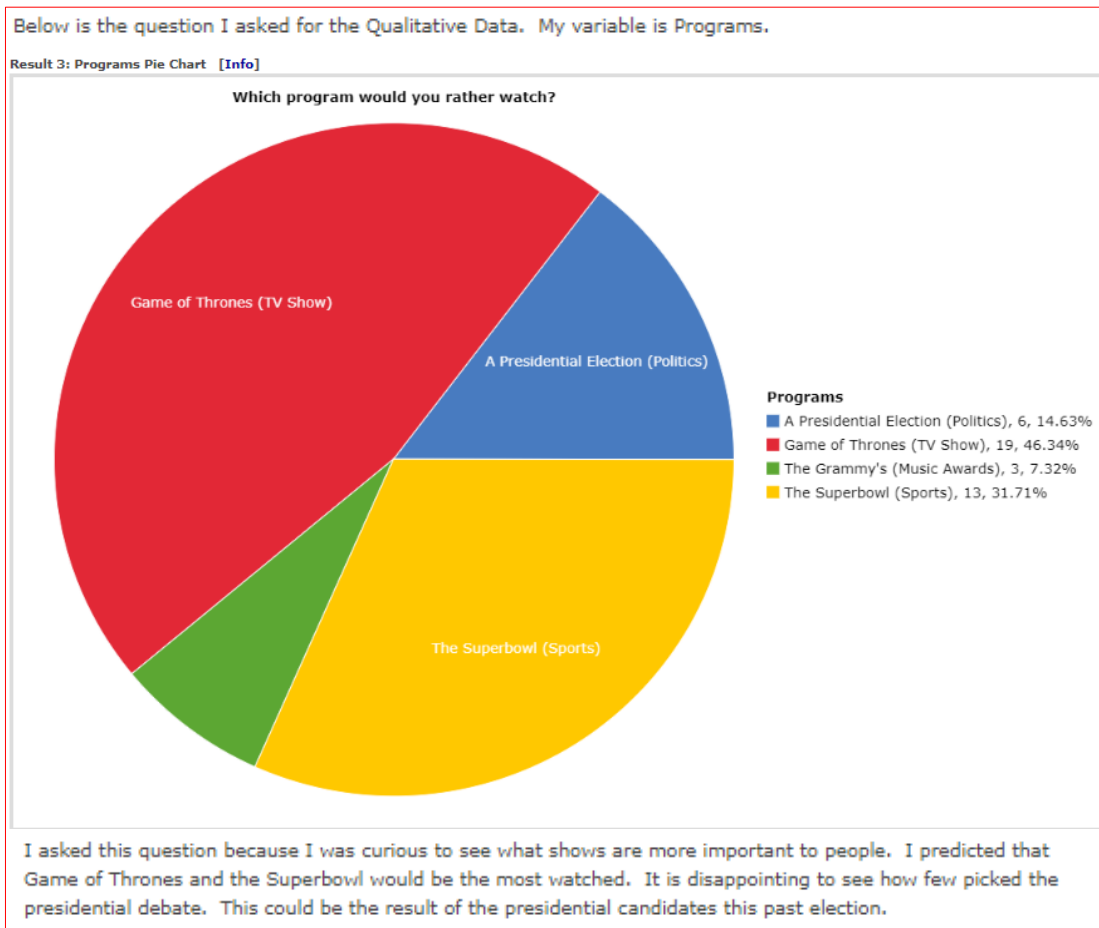


Figure 7: Annie's Data in Report.

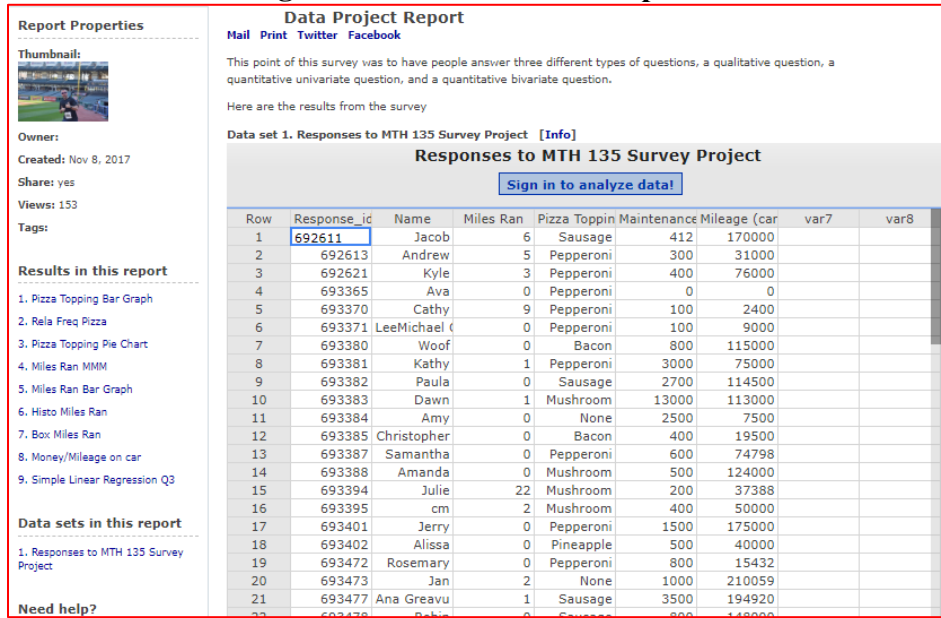
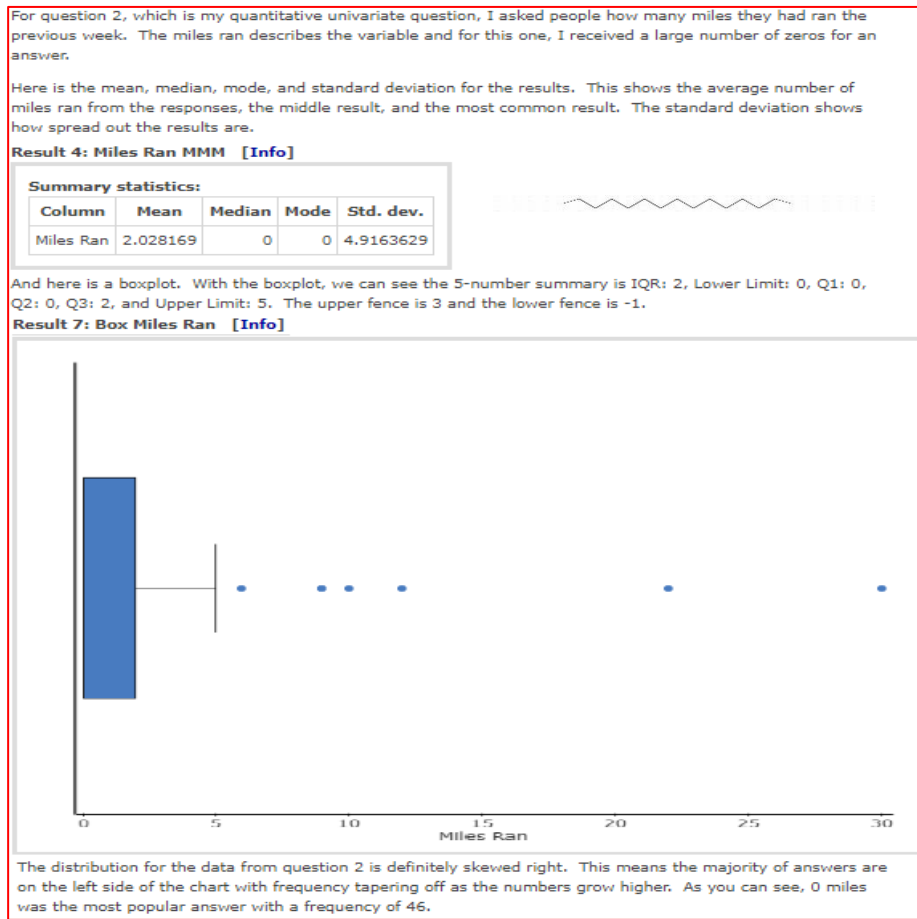


Figure 8: Annie's Quantitative Data Set #2 (Partial Report).



Once the report is complete, the URL is submitted through the BlackBoard assignment link and graded using the [project rubric](#). After the individual reports are graded, students can then share the report with our StatCrunch Group for further class discussions.

Lessons Learned from the First Semester

- Students were surprised at how difficult it was to collect 50 survey responses. Perhaps collecting fewer responses would be sufficient, yet at the same time, this led to a great discussion as to the difficulties researchers face in collecting data.
- Before assigning the project, it is a good idea to provide an example of “messy data” that would need to be cleaned before performing data analysis [i.e., data with labels, numeric data written out using words, unexpected units of measure (inches when expecting feet feet)]. This encourages students to write comprehensive survey questions and when possible to force a numeric answer choice for quantitative data and using appropriate multiple-choice questions for qualitative data.
- Surveys shared “with everyone” allow non-StatCrunch users to complete the survey. The link can be shared through any social media.
- Reports need to be made available “to everyone” so the submitted URL can be accessed by the instructor for grading.
- Individual reports should be shared with the StatCrunch Group only after the grading is complete.

Conclusion

This project was updated and improved each time it was used over the past three semesters. The main benefits to students include learning how to use the StatCrunch Survey and Report tools, and collecting and analyzing real-life, meaningful data.

References

Carver, R., Everson, M., Gabrosek, J., Rowel, G. H., Horton, N., Lock, R., Mocko, M., Rossman, A., Rowell, G.H., Velleman, P., Witmer, J. & Wood, B. (2016). *Guidelines for Assessment and Instruction in Statistics Education (GAISE) College Report*. Technical report, American Statistical Association.

Pearson Education. (2017). *StatCrunch*, Retrieved from <http://statcrunch.com>.

Sullivan, M. & Woodbury, G. (2016). *Interactive Statistics: Informed Decisions Using Data*. Boston, MA: Pearson Education.

West, W. (2009). Social data analysis with StatCrunch: Potential benefits to statistical education. *Technology Innovations in Statistics Education*, 3(1).