Udacity DAND Tableau Project

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Section 1: Summary

My Tableau visualization tells the story of why the NHL Pittsburg Penguins (PIT) were the best team in the 2016-2017 season, even though the Washington Capitals (WSH) ranked first at the end of the regular season.

PIT won the Stanley Cup, so one could argue that "of course they are the better team". My project looks at the statistics to see if they support this conclusion, or if PIT just had a lucky run in the Playoffs.

Word on the street is that WSH choked in the playoffs, whereas PIT, under the leadership of Sidney Crosby gained momentum and won the cup.

My project concludes that Pittsburg had overall better statistics in the regular season and rightly won the Stanley Cup; even though Washington was ranked #1 in game points at the end of the regular season.

Section 2: Design

I wanted my Tableau story to include a variety of interesting and interactive visualizations (viz / vizzes).

Types of Charts:

- I did not have geographic data, and so I could not create a "map" viz.
- Nor did I have timeline data to create line charts.
- I did not like the squares viz with sizes and degrading colors of squares to show values because I did not find it easy to read at a glance. It may be good in some situations, but not for my data.
- I mainly had single or two variables, but I also used color to add a third dimension where it made sense to do so.
- Horizontal bar charts made the most sense, with team names on the Y axis because I had many team names. Horizontal bar charts have the ability to scroll down to see the teams.
- Where I had two variables, I used bubble charts with different types of shapes and I added color for a third dimension.
- I also threw in a pie chart for good measure. I learned how to make the pie bigger with Ctl B. The community pointed out that B is for bigger, which makes it easy to remember.

Colors:

- I used solid colors and gradient colors.
- I used hues of one color and multi colors.
- I used opaqueness.

- Wherever possible, in my vizzes and story, I consistently used Dark Blue for Pittsburg, Dark Purple for Washington, and Pink for the other text in my Story.
- I avoided the use of Red / Green combinations in deference to those who are color blind.

Titles, Labels and Legends:

- I made the titles descriptive of what the viz was showing, and how to interact with the viz.
- I used descriptive labels rather than field names.
- As a result of feedback from my peers, I made the font big enough for them to read the text and values while I was presenting to them.
- I added grid lines and drop lines to better read / follow the data.
- I kept the rows in the titles of my vizzes, dashboards and story consistent in color, boldness, underline and font size.
- In my story, I gave additional instruction on how to interface with the sheet, and I kept that panel on the right hand side, under the legend.

Data Points:

- I added annotations to points to highlight Pittsburg and Washington in charts that had a lot of data.
- I often used color for the third dimension; and instructed the reader in the title on what the color represented and how to use it to gather information.
- My peers did not like the use of stars because they were not solid enough to track the data, so I changed them to filled squares.
- I made the shape sizes big enough for my peers to easily see them.
- When the horizontal bars blended together, I changed the thickness of the bars and added row lines to separate them.

Sets:

- There are a lot of teams in the NHL. The data was somewhat overwhelming, and all the teams were not necessary in order for me to meet the objective of the project.
- I considered how to logically reduce the number of teams while maintaining the integrity of the data.
    - I researched which teams made it into the playoffs.
    - In one of my peer review sessions, my peers could not remember exactly which teams from each divisions made it into the playoffs. So, for the next peer review, I made sets so that I could quickly show them, and quickly pull a set into a viz.
    - Once I had decided to focus on Pittsburg and Washington in my objective, I created a set of those 2 teams so that I could pull them in and out of vizzes as required / as it made sense to do so. I also dragged that set to the color shelf to highlight those two teams on a particular graph.

Regression Lines:

- I used regression lines to see if there was a relationship between statistics; especially when it was not obvious.

Dashboards:

- I used two charts on my two dashboards.
- I used interactive filters with instructions to the user on how to isolate one or multiple teams.
- I used statistics that are meaningful to meet my overall objective.

My Story:

- I used boxes with descriptive titles to move through the sheets so that the reader could easily jump back and forth between the boxes.
- I gave instructions in the title on how to move through the story.
- I kept color consistency throughout the story sheets for easy recall.
- I started my story with the objective.
- I included each type of graph, including a dashboard, in my story.
- I included each type of relevant statistic that contributed to the overall conclusion.
- I included a summary / conclusion slide.

Changes after collecting Feedback:

- The database that I chose changed when my peer said that the default baseball dataset was not interesting and that he would prefer NHL data, especially since it is hockey season.
- I originally had 3 sheets in my NHL data, and I tried to use Tableau's "Union", but the data became too messy, with too much repetition, so I converted the data myself to a single sheet.
- I sorted the data and isolated the data points that my peers were interested in and I sketched out the fields that I wanted on each graph.

Graph Sketch	By Team	Ideas
G / 60	Goals per 60	Bars, in team alpha order.
P/GP by Team	Points per Game	Bars with Goals as 3rd dimension.
P/GP/60	Points per Game per 60	Same as Points per Game
Net +/- / Team	Net +/- .... Add up all the players' +/- per team.	Bars will be interesting going from Positive to Negative.
FOW% / Player (Faceoff Win %)	Faceoff Win %	Descending shapes with teams of interest highlighted
PIM / 60	Penalties in Minutes per 60	combine with Hits. Shapes with regression
HITS / 60	Hits per 60	combine with PIM
S / GP / Team	Shots on Goal per Game	Combine with FOW% in shapes. See if there is a trend. Pie chart for fun for teams of interest.
S / GP / 60 / Team	Shots on Goal per Game per 60	Same as previous
PPG / GP /60 / Team	Power Play Goals per Game per 60	Dual bars with Goals or Dual bubble shapes

Graph Sketch	By Team	Ideas
EVG% EVG / (EVG + EVA)	Even Strength (EV) Goals % (EV Goals For / (EV Goals For + EV Goals Against))	Combine with PP% with trend
PP% PPG / (PPG + PPA)	Power Play (PP) Goals % (PP Goals For / (PP Goals For + PP Goals Against))	
CF%	Corsi For% at EV: Above 50% means the team was controlling the puck more often than not with this player on the ice in this situation. (For / (For + Against))	Put CF% and FF% on the same chart to compare
FF%	Fenwick For % at Even Strength: Above 50% means the team was controlling the puck more often than not with this player on the ice in this situation. (For / (For + Against))	See CF%
A	Assists	Combine with Goals for Teams of Interest Set

- As I created graphs, I used the "Show me" feature to pick the graph types that best represented the data. I also used the Marks Card to play with colors, sizes, labels, details, tool tips and shapes until I found the combination that I liked best.
- As I created graphs according to my sketch, I added third dimension with color and text in the title and sidebar to explain the graphs.
- Initially my peers wanted data by "defense" position, but after they looked at some of the statistics, they decided that it was a team sport and asked me to remove "defense" as a criteria.
- I refined my Objective based on the feedback from my peers on what their objective was.
- When my peer pointed out that the number of points by team in my chart did not make sense, I reviewed my data and added a filter that would correct the results.
- When my peers were getting confused by the sheer volume of data for all 30 teams, I created sets to be able to quickly show the data for the two main teams of interest, for the playoff teams, for the conference teams and for the division teams.
- The sizes of the fonts changed when my peers could not read them as I presented to them.
- Some sheets were not used at all in the story because my peers said that the comparison of the statistics was irrelevant or immaterial.
- Initially my peers wanted statistics by team and by player. But after I completed the story by team, I realized it was enough information for one session, and that any more would be overwhelming, so I abandoned "by player".

Section 3: Feedback

February 19, 2018: First review – peers: Mike in person

- Udacity supplied baseball data which I wanted to use to keep my data wrangling down to a minimum.
- I showed the baseball data to my husband, Mike, and asked him which statistics he would like me to report on. He said none of them. He said they were not interesting statistics. He said that he did not recognize the players. We googled 3 or 4 of the players at the top of the list, and google could not find them. He said it was of no interest to him.
- I asked him what would be of interest to him.
- He said that NHL statistics would be of interest to him. We looked at www.nhl.com together. We picked the 2016/2017 season.

February 20, 2018: Second review – peers: Zach in person

- I was having trouble downloading the NHL data into a spreadsheet, I googled it and everyone else was also having trouble. Using Internet Explorer, there is a selection that says "download to excel", but it doesn't come into excel in the same format. Even copy / paste did not work. In Firefox there is no such selection; I had to copy / paste but it all comes into column A as one big stream in excel. There was not even a blank row between the records. I showed my son the problem and we figured out how to do it.
    - There are 888 records.
    - At the bottom of the player matrix on the website, there is a selection for "row", which means, "how many rows do you want displayed?" I selected the maximum of 100, so that I would only have 9 pages of results.
    - Then I selected all the data on each page and copied it into an excel spreadsheet, and as I said, it put it all into column A.
    - I repeated that for each of the 9 pages, appending each page to the end of the data in column A. The data started on row 1 and ended on row 20,424 (23 data elements for each of the 888 records.
    - I named that excel sheet "Raw Data".
    - On a new sheet that I named "Formula Data", I did this:
        - In cell A2 I typed the word: cols
        - In cell A3 I typed the number: 23
            - Because each player has 23 data elements in the data stream in col A on sheet "raw data".
        - In cell B2 I typed the word: row
        - In cell B3 I typed the number: 0
        - In cell B4 I typed the formula: =B3+1
        - I copied that formula from cell B5 to B890
            - The resulting numbers are 0 to 887
        - In cell C1 I typed the number: 1
        - In cell D1 I typed the formula: =C1+1
        - I copied that formula from cell D1 to Y1
            - The resulting numbers are 1 to 23

        - In cells C2 to Y2 I copied (or typed) the field names according to the matrix at the link.
    - So far so good? The setup is done.
    - Now the fun part:
        - In cell C3 I typed this formula: =INDEX('Raw Data'!$A:$A,(C$1+$B3*A3))
            - Notice how C$1 is added to $B3. Since C$1 is 1, $B3 had to start at zero so that the total was the first cell (A1) on the "raw data".
        - I copied that formula from cells C3 to Y890
        - And voila.
    - The last step for setup for my Tableau project:
        - I created a new sheet called "Data Values"
        - I selected all the data values on the "Formula Data" sheet, including the field titles, from cells C2 to Y890, and pasted them as values to the "Data Values" sheet, starting in cell A1.
        - I also saved the "Data Values" sheet as a new excel workbook.
    - Mission accomplished... now I can continue with my Tableau Project.

- **March 6, 2018: Third review – peers: Mike and friend Ken in person**
    - Once I had created the data, I reviewed it with my husband and our friend Ken during intermission of a hockey game. They bounced around ideas and came up with the following statistics that they would like:
        - Points per Game Played by Player
        - Points per Game Played per 60 by Player
        - Points per Game Played per 60 by Defense Player
        - Points per Game Played by Team
        - Points per Game Played by Defense Players by Team
        - Plus / minus by Player
        -

P/GP by Player
P/GP/60 by Player
P/GP/60 by Team
+/- by Player
Possession / Defense Pos / Team
P/PG/60 / Defense Pos / Team
G / Defense Pos / Team

SHG / 60 / Team
PPG / 60 / Team
Net +/- / Team
FOW% / Player (Faceoff Win %)

- **March 14, 2018: Fourth Review – Mentor: Raman**
    - As I was preparing to post online the instructions of how I converted the NHL data to xls, I found this link at "Hockey Reference". They had already created a good summary of the statistics that could be downloaded into an xls format, so I did not post my info.
    - https://www.hockey-reference.com/leagues/NHL_2017.html
    - I looked at their data, and I saw that if a player had played for more than one team in the year, then they had created 3 rows for the player: total row, row for team 1 and row for team 2. I like that.
    - I downloaded 3 of their sheets:
        - Players_by_Team
        - Players_Advanced
        - Teams
    - I spent the next 3 weeks combining the data and wrangling it into a consolidated format.
        - I tried the Union feature of tableau to combine the spreadsheets, but it did not give satisfactory results because of the way that it created multiple rows for every instance that was a little different.
        - I played around with Tableau Public and published some very preliminary vizzes, which I later deleted because they were lame.
        - I made a list of the new fields and printed it out for review with my peers at our next meeting.
    - I spent hours and hours installing Tableau for Desktop and getting it to accept the license that Udacity had given me.
        - I replayed the Udacity lessons over and over to make sure I was not missing anything.
        - I read the Tableau posts.
        - I searched the Udacity forum.
        - I reached out to Udacity Support – who tried to help but to no avail.
        - I reached out to Tableau Support Education, but they could not help.
        - They suggested support@tableau.com, who finally helped with a very simple solution.
        - In parallel, I had reached out to my Mentor, Raman, who found a blog for me to follow as few hours before tableau support answered. My mentor also gave me

advice on publishing my vizzes, which I plan to practice before completing the whole project.

- **<u>March 20, 2018: Fifth Review – peers: Mike & Ken in person</u>**
    - At intermission during the hockey game, I gave my peers the printout of the full list of 93 fields that I had consolidated from the 4 excel files that I had downloaded.
    - They came up with the following requirements:

By Player
Games Played
Goals per 60 minutes
Points per Game
Points per Game per 60 minutes
+/-: Goals For less Goals Against while the player is on the ice.
Faceoff Win %
Penalties in Minutes per 60 minutes
Hits per 60 minuts
Shots on Goal per Game
Shots on Goal per Game per 60 minutes
Power Play Goals per Game per 60 minutes
By Team
Goals
Points per Game
Net +/- .... Add up all the players' +/- per team.
Faceoff Win %
Penalties in Minutes
Hits
Shots on Goal per Game
Power Play Goals per Game
Even Strength (EV) Goals % (EV Goals For / (EV Goals For + EV Goals Against))
Power Play (PP) Goals % (PP Goals For / (PP Goals For + PP Goals Against))
Corsi For% at EV: Above 50% means the team was controlling the puck more often than not with this player on the ice in this situation. (For / (For + Against))
Fenwick For % at Even Strength: Above 50% means the team was controlling the puck more often than not with this player on the ice in this situation. (For / (For + Against))
Goals for Defense players only

Points per Game per 60 by Defense Positions
Goals by Defense Position

- On March 6th, they had also asked for:

Possession / Defense Pos / Team

  - But I was unable to find that statistic, and so they struck it from the list.

- **March 21, 2018: Sixth Review – peers: Mike & Ken by email**
  - I asked Mike & Ken by email if they could craft a "specific clear finding" that they would like to have so that I could build a story around it.
    - I gave them the example from the Tableau training: "what countries have the highest CO2 emissions and has the trend by country changed over time?"
  - This is their response, which I will shorten down as I prepare the story board:
    - The clear mission is to identify the 'best' player / team, understanding what defines the 'best'.
    - Combining X/60 factors, with +/1, Corsi and Fenwick is such an attempt. Who is 'best' - not only who is 'best' but what factors when combined mathematically identify and define such - Crosby vs Ovi, McDavid vs Schiffle(?), ...?
    - The definition is not just goals / 60 or hits per 60 but rather a combination of several criteria.
    - Once the criteria are confirmed for individual NET OFFENSIVE players, it can then be employed to evaluate individual NET OFFENSIVE teams.
  - They also asked me to eliminate the following criteria: goals for defenseman / 60 & goals by defense position.
    - They said that the above selection criteria assume offence is more significant than defense. This assumption is not true.

- **March 25, 2018: Seventh Review – Mentor: Raman**
  - Reference first Tableau Workbook published at Tableau Public "Teresa_Aysan_NHL_v_0_01" at this link: https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_0_01/GandPtsbyTeamDesc?publish=yes
  - I asked my mentor Raman if he could access it.
    - As a test before I go too far in my project.
    - He replied that he could.
- **Mar 25, 2018: Eight Review – Peers: Mike and Ken by email**
  - I sent the same link to Mike and Ken, to see if they could see my first viz on Tableau Public.
    - They both replied that they could.
    - Ken said: "Hey Stats Lady, Yes, it is visible. Content is out of this world!!! See you Tuesday for more.

- **Mar 27, 2018 am: Ninth Review – Peers: Mike in person**
    - Mike said that he found the first chart that I sent him by email very interesting. He said it made the statistics so much more fun to review. ☺. This morning, he was watching me work on the charts and he asked questions on the number of points by team at the end of the 2016-2017 season, and who was leading. When I told him, he pointed out that the number of points did not make sense, that they should only be around 100 for the top teams. The number of points that I was showing in my charts were much higher than that. I checked my data, and the data source was correct. I checked my filters and realized that I needed another filter to separate the teams from the players at large.

- **Mar 27, 2018 pm: Tenth Review – Peers: Mike and Ken in person**

    - Reference: Tableau Workbook that I saved on Tableau Public: "Teresa_Aysan_NHL_v_0_03_20180327am"
    - https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_0_03_20180327am/TeamStory?publish=yes
    - I showed Mike and Ken the tableau charts that I had prepared by team. I did not show them the story because I had only done a few exploratory slides, and I wanted to wait to see which of my graphs they found most interesting.
    - They were impressed with the quality of the graphs and with my ability to modify fields and teams as required.
        - I had made sets of teams so that I could show all teams, all 16 playoff teams, the 8 Eastern Conference playoff teams, the 3 E-Atlantic playoff teams, the 3 E-Metro playoff teams, the 2 E-WildCard playoff teams, and same idea for the Western Conference.
        - I knew my data inside out, and I could quickly copy a graph sheet and drag off / on fields as my peers wished.
    - They gave me feedback on some of the things that they did not like:
        - They did not see the relevance of the following graphs, so I did not use them in the final Story:
            - Penalties in Minutes to Hits.
            - Goals % to Power Play Goals %
        - They wanted larger fonts on the axes. Which I incorporated in my final submission.
    - We ran out of time in the intermission between periods, but Ken kindly finished the review with me. We agreed to do the reviews for an hour before the start of the game.
    - Later, by myself, I thought about the overall project, and reread the rubric:
        - The objective as expressed by Ken was to "identify the 'best' player / team, understanding what defines the 'best'".
        - I decided that my project only needed to include findings by team. That it would be overwhelming to also include a whole section by player.
        - Based on the review with Mike and Ken, it was best to focus on a small subset of the teams, since only a few teams would be "best" in the end.

        - The Washington Capitals were ranked #1 after the regular season, but the Pittsburg Penguins won the Stanley Cup. So, I decided that those two teams should form my main subset.
        - But I also kept the "Playoff teams" subset as a third dimension in many of my graphs to compare how WSH and PIT compared to the remainder of the playoff teams.
- **Apr 1, 2018 pm: Eleventh Review – Peer: Roy in person – audio recording – Story in presentation mode**
    - I played my tableau story for my peer, Roy.
        - We audio recorded the session which I included in my submission.
    - Reference published on Tableau Public: Tableau Workbook: "Teresa_Aysan_NHL_v_1_00_20180401"
        - https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_00_20180401/TeamStory?publish=yes
    - Here are his comments:
        - There is a clear relationship between the number of Shots on Goal, Power Play Goals and minimizing the number of Penalty Minutes.
        - The team that can best exercise that discipline has a much better chance of winning the Stanley Cup.
- **Apr 3, 2018 pm: Twelfth Review – Peers: Mike and Ken in person – audio recording – Story in presentation mode**
    - I updated my tableau story because of my review with Roy.
        - I played the following version of my tableau story with my peers, Mike and Ken.
        - We audio recorded the session which I included in my submission.
    - Reference published on Tableau Public: Tableau Workbook: "Teresa_Aysan_NHL_v_1_01_20180403"
        - https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_01_20180403/TeamStory
    - Here are their comments:
        - Ken questioned the total of + / -.
            - We reviewed the data source and showed how it was calculated as the total of all of the players' + / -.
            - That the + / - is at the player level.
            - They accepted my definition of + / - and helped me change the title to reflect that it is the sum of the Washington's players.
            - After the call, I did further analysis on + / - and sent them an email with other alternatives, but that it did not change the overall trend that Washington was ahead of the other teams.
        - Mike was surprised that Pittsburg was 3rd last in the FaceOff Win %s. I pointed out that the scale was from 47 to 54%, then he understood.
        - Without the extra shots on goal, they could have had even fewer goals.
        - Corsi % and Fenwick % - Ken and I explained to Mike that it is a measure of possession. Mike asked who was the best: Boston. And the worst: Arizona. Ken

said that Arizona makes sense. Boston coaching changed mid-season and they started to improve even into the 2017/2018 season.

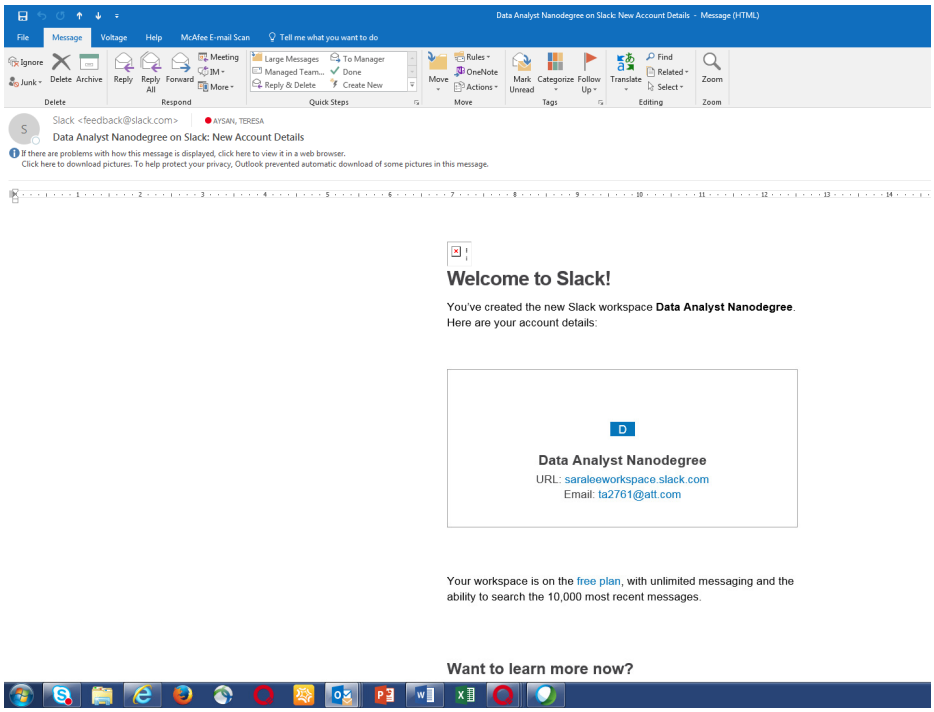
- Mike: wish we could just import the current season's statistics into this model. ☺
- The Stanley Cup was played between Pittsburg & Nashville – different conferences. Pittsburg had beaten Washington for the Eastern Conference title.
- Mike: Washington has a reputation for chocking.
- They understand the statistics.
- And loved the presentation. ☺

- April 5, 2018: I updated my tableau story with many different slides for + / - and published my final version here:

  https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_03_20180405/TeamStory?publish=yes

Accessing Data Analyst Nanodegree Slack:

The project instructions said: "Share a link to your project in the Data Analyst Nanodegree Slack and ask others to share constructive criticisms. Be sure to offer advice to others who are seeking feedback too." So, I signed up for Slack using the name Sara Lee and saraleeworkspace.com. It asked me which team, and I entered Data Analyst Nanodegree. It told me that I had created the team. I expected the team to have already been there with other students' posts. See screenshot below email from Slack. I hope it is not a requirement. It's not in the rubric.



April 3, 2018: I received instructions from my mentor on how to access DAND Slack, but then my mentor changed and I lost that chat.

April 5, 2018: I access the DAND forum and that helped me to figure out how to get on the DAND Slack.

- I published my final version link on slack for others to look at.
- I commented on:
    - Bri's post of April 4, 2018
    - Alena's post of April 5, 2018
    - Todd's post of April 6, 2018

Submission

The project instructions say, "You need to submit an initial version of your data visualization and the final version with the corresponding write-up." I looked at the "Submission", and there is no selection for "initial version". So I asked my mentor and she said that I just have to publish the versions on Tableau Public, which I did.

- I published my initial version on Tableau Public: https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_0_01/GandPtsbyTeamDesc?publish=yes (March 25th, 2018 peer review)
- I published intermediary versions:
    - https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_0_03_20180327am/TeamStory?publish=yes (Mar 27, 2018 peer review)
    - https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_00_20180401/TeamStory?publish=yes (April 1, 2018 peer review)
    - https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_01_20180403/TeamStory (April 3, 2018 peer review)
- And I published my final version: https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_03_20180405/TeamStory?publish=yes (April 5, 2018)
- I published the write-up and all other files on GitHub.

Section 4: Resources

Here are the resources that I consulted to do this project:

Link to Tableau training: https://public.tableau.com

Link to my data: NHL Hockey Data for the 2016/2017 Hockey Season http://www.nhl.com/stats/player?reportType=season&seasonFrom=20162017&seasonTo=20162017&gameType=2&filter=gamesPlayed,gte,1&sort=points,goals,assists

This is good for summary statistics that "Hockey Reference" has already created: https://www.hockey-reference.com/leagues/NHL_2017.html

https://www.calculatorsoup.com/calculators/time/time-to-decimal-calculator.php

http://www.consultdmw.com/excel-time-conversion.htm good one for formula to convert time to decimals

https://onlinehelp.tableau.com/current/pro/desktop/en-us/publish_workbooks_tableaupublic.html Save workbooks to tableau public from desktop

https://www.tableau.com/products/desktop Tableau Desktop

https://discussions.udacity.com/search?q=DAND%20Tableau

https://discussions.udacity.com/t/dand-tableau-cannot-connect-to-tableau-server/259324/10 no help here

https://discussions.udacity.com/t/tableau-desktop-to-tableau-public/601911 helpful to publish to tableau public

https://discussions.udacity.com/t/dand-tableau-access-tableau-desktop-with-my-licence/640782 my question on how to enter my license # into Tableau.

https://www.udacity.com/contact no help to get the postal code

https://craft.co/udacity/locations for Udacity postal code

https://superuser.com/questions/300351/why-does-excel-not-auto-update-my-equations-anymore

https://www.ablebits.com/office-addins-blog/2014/11/04/excel-sumif-function-formula-examples/

https://www.ablebits.com/office-addins-blog/2014/11/04/excel-sumif-function-formula-examples/#sumif-text-criteria

https://www.wallstreetoasis.com/forums/excel-help-cells-do-not-update-when-they-reference-another-excel-file

https://www.mrexcel.com/forum/excel-questions/592363-formula-refs-not-updating-after-sorts.html this one somewhat helps

http://onlinehelp.tableau.com/v10.5/pro/desktop/en-us/help.htm#viewparts_marks_markproperties_color_ex1.html?Highlight=show the legend on the graph not helpful

http://onlinehelp.tableau.com/v10.5/pro/desktop/en-us/help.htm#forecast_how_it_works.html?Highlight=regression helpful for trends

http://onlinehelp.tableau.com/v10.5/pro/desktop/en-us/filtering_global.html

http://onlinehelp.tableau.com/v10.5/pro/desktop/en-us/filtering.html#ShowFilter

http://onlinehelp.tableau.com/v10.5/pro/desktop/en-us/filtering.html

https://www.google.ca/search?dcr=0&source=hp&ei=r5q7WtX_K6rGjwSQsq3ADw&q=what+colors+are+difficult+for+colorblind&oq=what+colors+are+diffi&gs_l=psy-

ab.1.0.0j0i22i30k1.36406058.36413450.0.36415490.25.17.0.5.5.0.223.2193.0j15j1.17.0....0...1c.1.64.psy-ab..3.21.2249.0..0i131k1.124.VaczBxB3v3c

https://en.wikipedia.org/wiki/Plus-minus

https://www.tableau.com/support/help

http://kb.tableau.com/articles/howto/displaying-zero-decimal-places-for-mark-labels

https://www.ryansleeper.com/3-ways-to-make-beautiful-bar-charts-in-tableau/

https://community.tableau.com/thread/150454

https://community.tableau.com/thread/119190

https://discussions.udacity.com/t/anyone-could-invite-me-to-dand-slack-group/178475/14

https://udacitydatascience.slack.com/join/invite/enQtMzQzMzUxNzk5MTQyLTA2NTlkMjc3OGU5MWFkMDU2ZjY1N2E0M2JjYTM4MDRkMTNiY2UyOWNlNGFhNDVjYmZlZGI0ZjczNjRkZjVmMDg

https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_0_01/GandPtsbyTeamDesc?publish=yes (March 25th, 2018 peer review)

https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_0_03_20180327am/TeamStory?publish=yes (Mar 27, 2018 peer review)

https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_00_20180401/TeamStory?publish=yes (April 1, 2018 peer review)

https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_01_20180403/TeamStory (April 3, 2018 peer review)

https://public.tableau.com/profile/teresa.aysan#!/vizhome/Teresa_Aysan_NHL_v_1_03_20180405/TeamStory?publish=yes (Final version)