Teaching in Massachusetts

Focus of Project: Examining the Average Teacher Salary in Massachusetts in 1998.

Description of Dataset:

The dataset is self-described as containing "data on test performance, school characteristics, and student demographic backgrounds for school districts in Massachusetts from 1998. It was obtained from Stock and Watson to accompany their Introduction to Econometrics, 2nd edition. There are multiple demographic stats including English-learners, Special Education Learners, as well as Low-income Free or Reduced Lunches. They have included two gateway testing scores from the Massachusetts Comprehensive Assessment System (MCAS) test which was mandatory for all MA public schools. The Data on the average district income came from the 1990 US Census.

This data was found using a Google Search which led me to a site at Githib.io located at https://vincentarelbundock.github.io/Rdatasets/doc/AER/MASchools.html

Objectives of Project:

- *Explore the Data Set*
- *Explain the Data Analysis*
    - *Whether it was fruitful or not (and within reason)*
- *Show the Main Story*
- *Use Appropriate Charts with some complexity to it*
- *Generate a report of the findings including the charts that were generated.*

Instructions:

1. *Gather and prepare your data from appropriate data sources.*
2. *Determine the story or message of your data visualization.*
3. *Build the data visualizations to tell your story.*
4. *Create a document to describe the data sources, their challenges, and key findings.*
5. *Explain the purpose of each visualization, why it was chosen, why it was effective. Explain the visualizations that you generated that did not make the final version.*

Instructions to Project can be found here:
https://drive.google.com/file/d/1XHgwXbrmcjezADCx3LJUjGBhUgf6LrBm/view?usp=sharing

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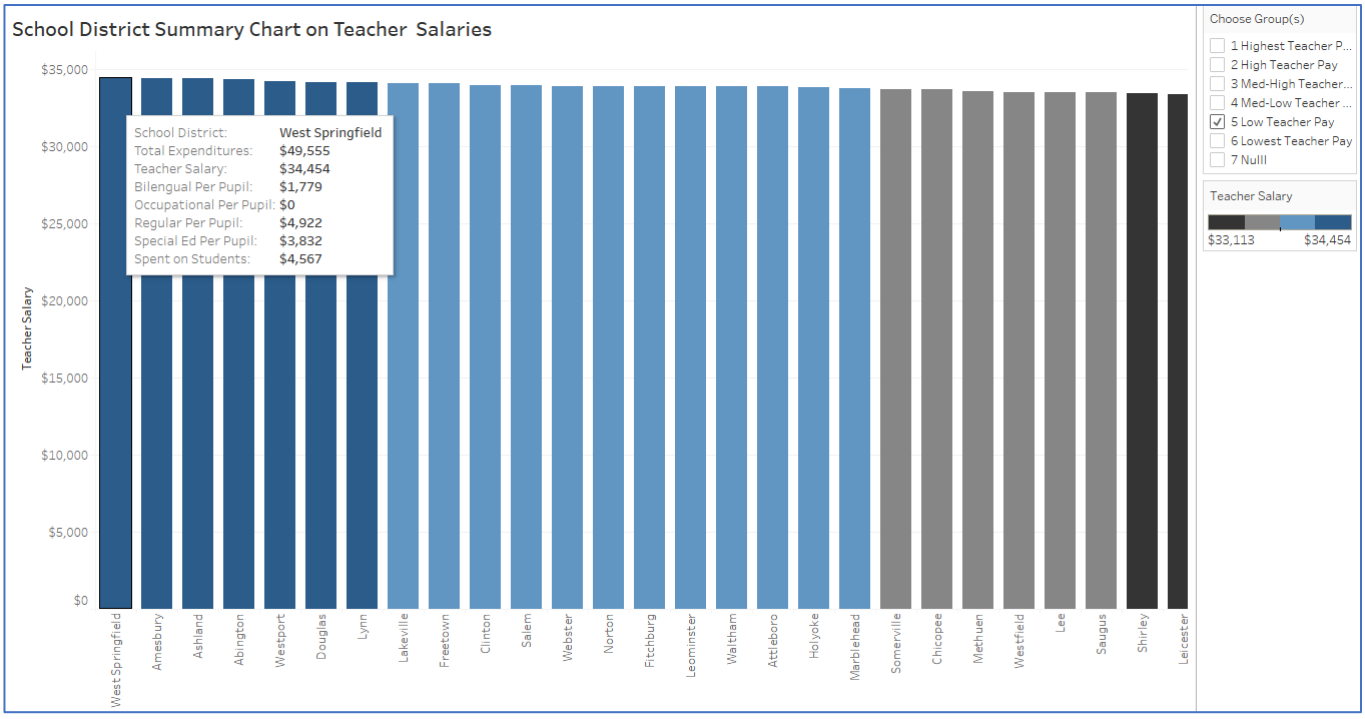
Exploring and Explaining Charts

1. Initially, a table was created to look at any missing or null values. The main objective includes an anlaysis of the Teacher Salaries Category, which was missing 25 data points. Initially, in my exploration, I did not know exactly what facets of categories I would compare to the Salaries, but I instantly recognized that there would need to be some accounting for these "Null" values. Additionally, both charts on this page were chosen to be simple and

distinct for certain categories.

2. Since the focus was on Teacher Salary, I plotted a simple bar chart to give an initial glimpse of these values sorted . I initially used the given category called "Teacher Salaries". It soon become evident that this was given in US dollars, but labeled in "K" groups. Intially, the thought was all the monetary amounts were in the same measurement. However, after careful examamination, it was found that the Teacher Salary was the only one measured in thousands so a calculation had to be made. Above you can see that the old category was named "Teacher Salaries" and the new category was named "Teacher Salary".

   Additionally, after initially creating a simple bar chart filled with monetary values to examine in the tooltip, I saw the need to organize the salaries into groupings. I initially plotted a histogram on top and looked at quartiles with medians. At this point, I realized that the 4 groups would not have the same number of values. So, I gave up the median values and just broke down the groups into 6 groups which would allow for better visibility. I decided that the Teacher Salary Groups would be the same on all my Charts, Dashboards and Stories.



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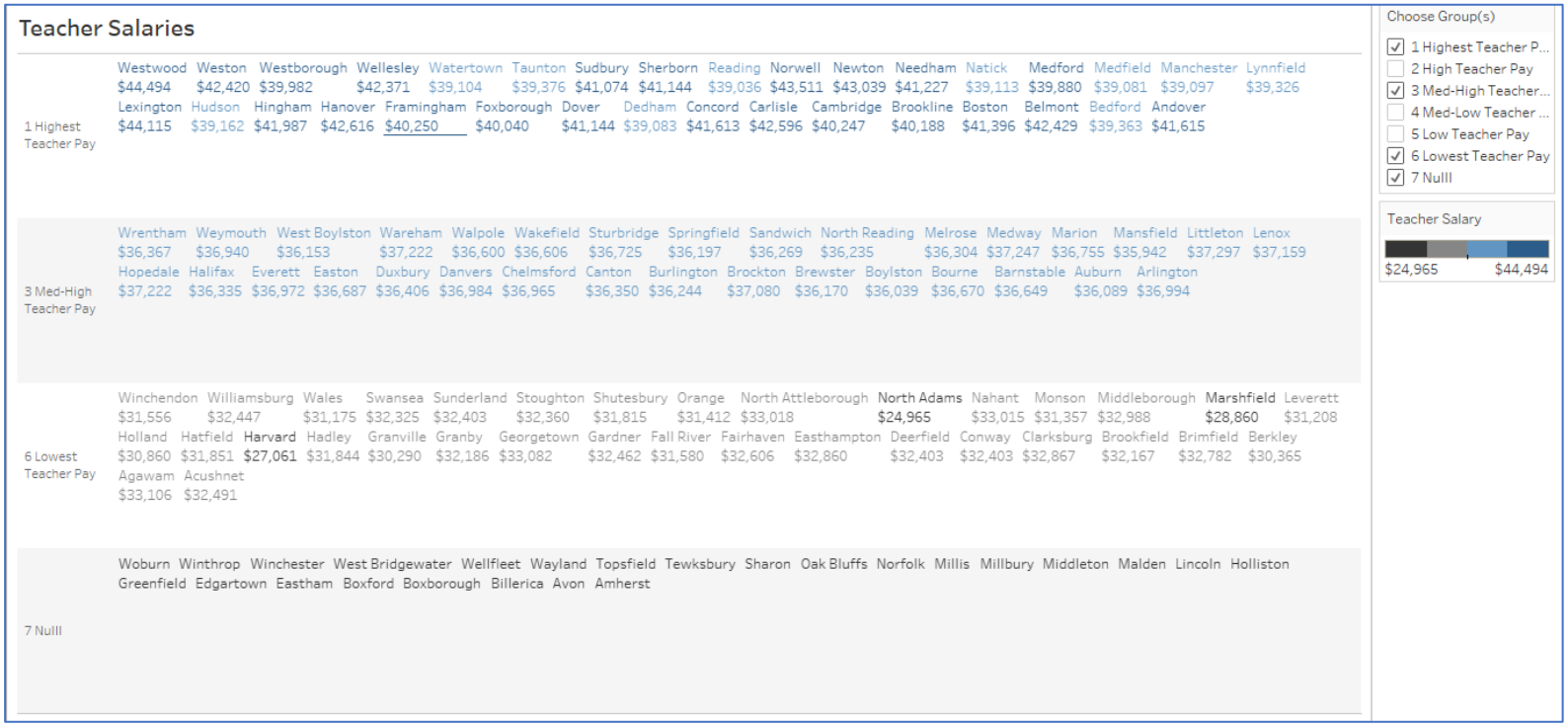
3. A simple chart was created just to display the Average Teacher Salary for the Teacher Salary Group(s) that were chosen. This is in the top left of every Dashboard which are all contained in the Storyboard. The idea is to keep the focus on Teacher Pay. It is dynamic for whichever groups are chosen in the Teacher Salary Group Filter.

   It was created by a simple calculation using the Last function. This function returns the average of all the values in the Teacher Salary partition of the table, from the first element to the last element (hence it's name).

4. I created a simple chart just to display the Average Teacher Salary in character form so I could test out my groups. Had the groups remained in groups of 4, the data would be even more cumbersome to analyze. As you can see below, only 4 groups fit on my screen. These School Districts were listed in alphabetical order by group to find it easier.

   An important part of this chart is the ability to see all the School Districts that did not have a value for the Teacher Salary category; they were "Null". This information could easily be listed in an Appendix, but this project did not have one.



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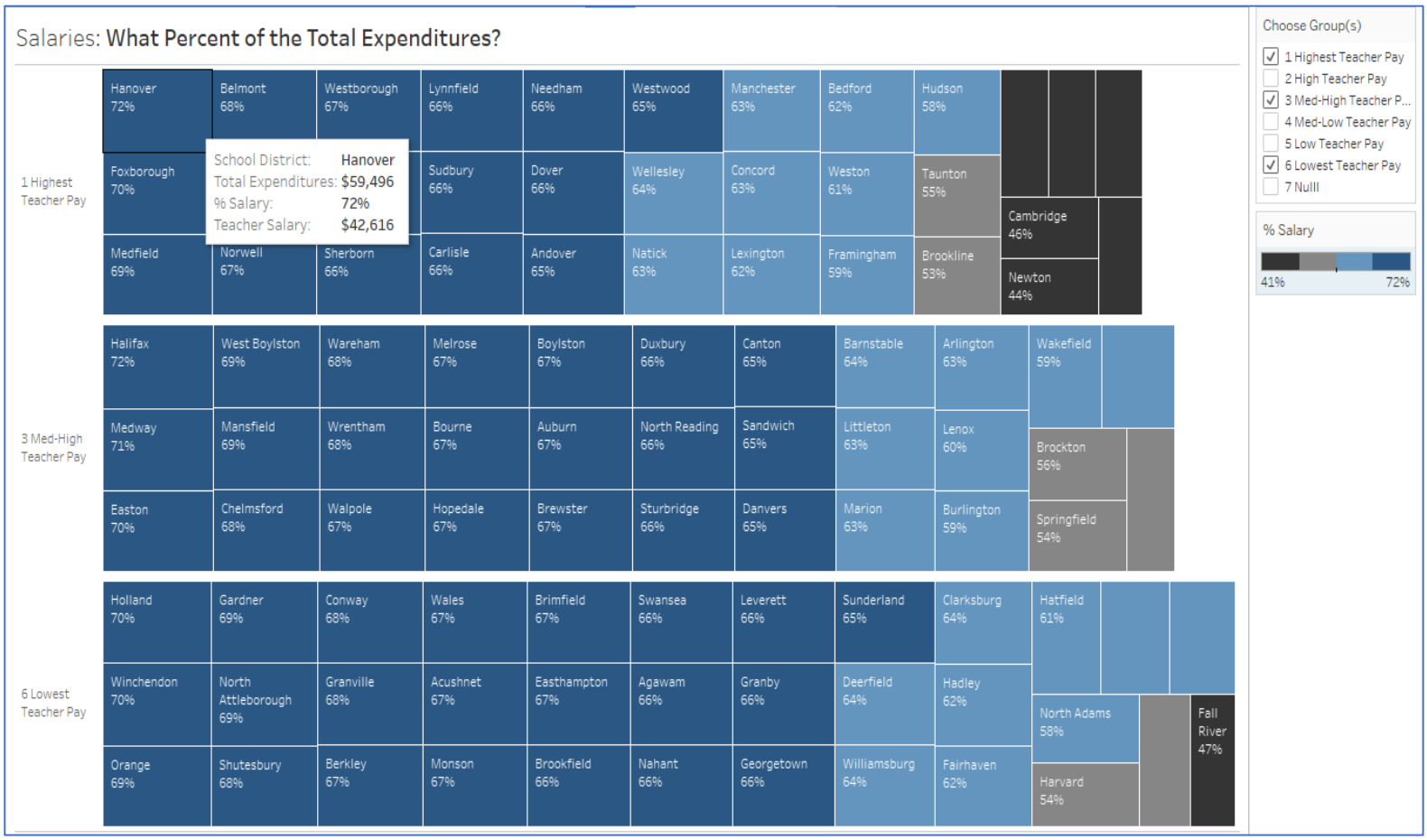
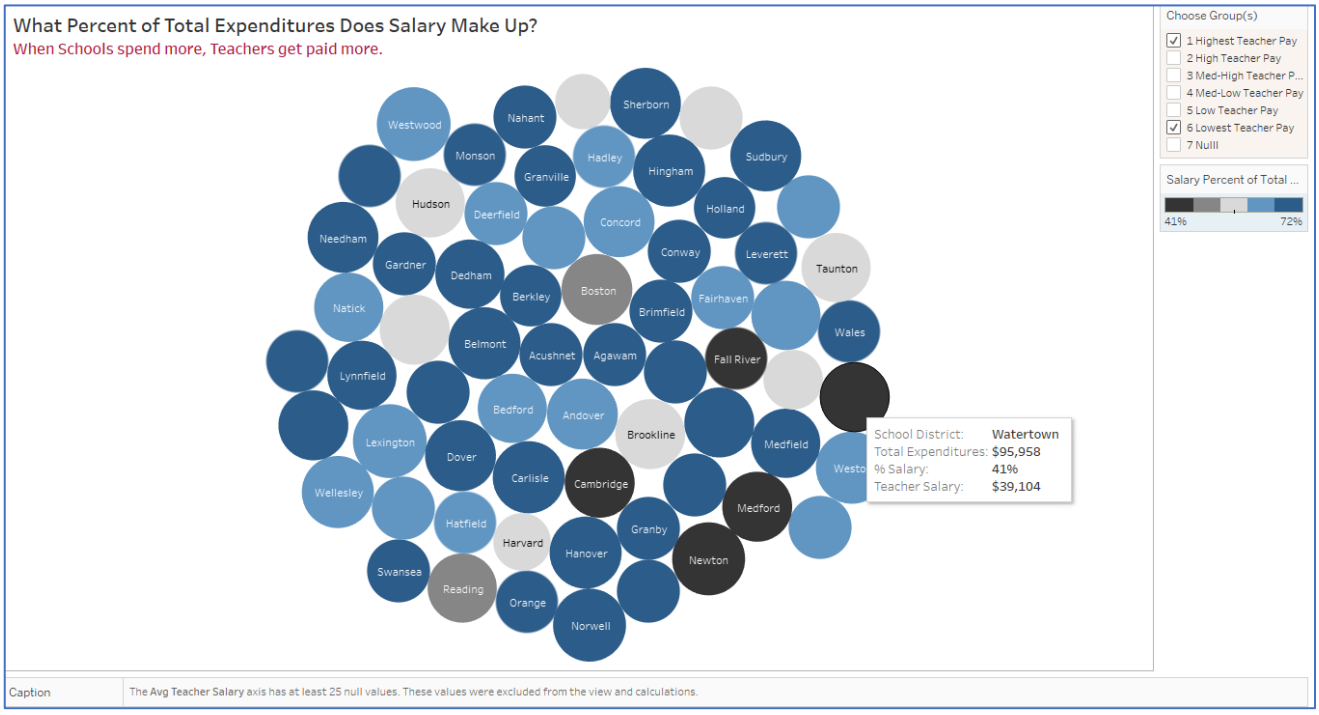
5. A “Total Expenditure” calculation was created by adding all the monetary categories that were given in this data set: Teacher Salary, Bilingual Per Pupil, Occupational Per Pupil, Regular Per Pupil, Special Ed Per Pupil, and Spent on Students. I then created a calculation to determine what Percentage did the teacher salary make up of the Total Expenditures for the School District. With so many School Districts in each group, the Tooltip was again used to hold the comparison data. The chart below is a Tree Chart with the % Salary as the Coloring Legend and is sorted with those percentages in descending order. As you can see in the simple Color Legend to the right, Hanover County had 72% of their Total Expenditures Budget categories for Teacher Salary. Looking in the chart above, in the “Highest Teacher Pay" Group, Westwood had the highest pay at $44,494. However, the Tree chart below points out that Hanover County has the highest % of the Budget going toward Teacher Salary at 72%.

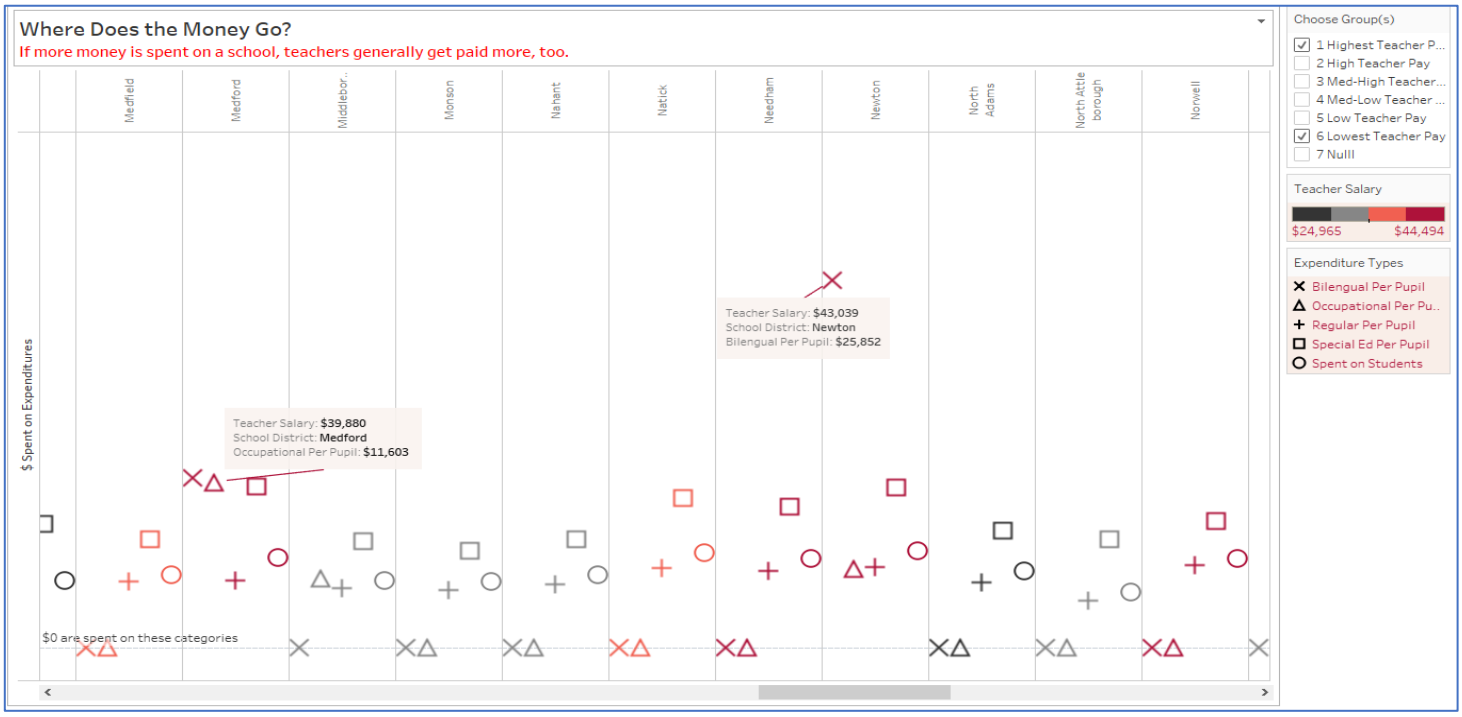
School District:	West Springfield
Total Expenditures:	$49,555
Teacher Salary:	$34,454
Bilingual Per Pupil:	$1,779
Occupational Per Pupil:	$0
Regular Per Pupil:	$4,922
Special Ed Per Pupil:	$3,832
Spent on Students:	$4,567



6. The same data was used but this time it was put into a bubble format with a Legend labeled “Salary Percent of Total Expenditures. After some peer review, it was determined that this chart was more pleasing to the eye. It was given a subtitle and a Caption to draw attention to the Overall focus of this chart.



7. To answer questions about what other costs go into the Total Expenditures, there was a chart to put the Budget Categories into. The Expenditure Types were symbolized by different shapes and colored according to the value of the Teacher Salary. This chart was hard to view with over 30 School Districts per group, but you can see below, that a large amount of them did not have funds spent on Bilingual or Occupational Pupils.



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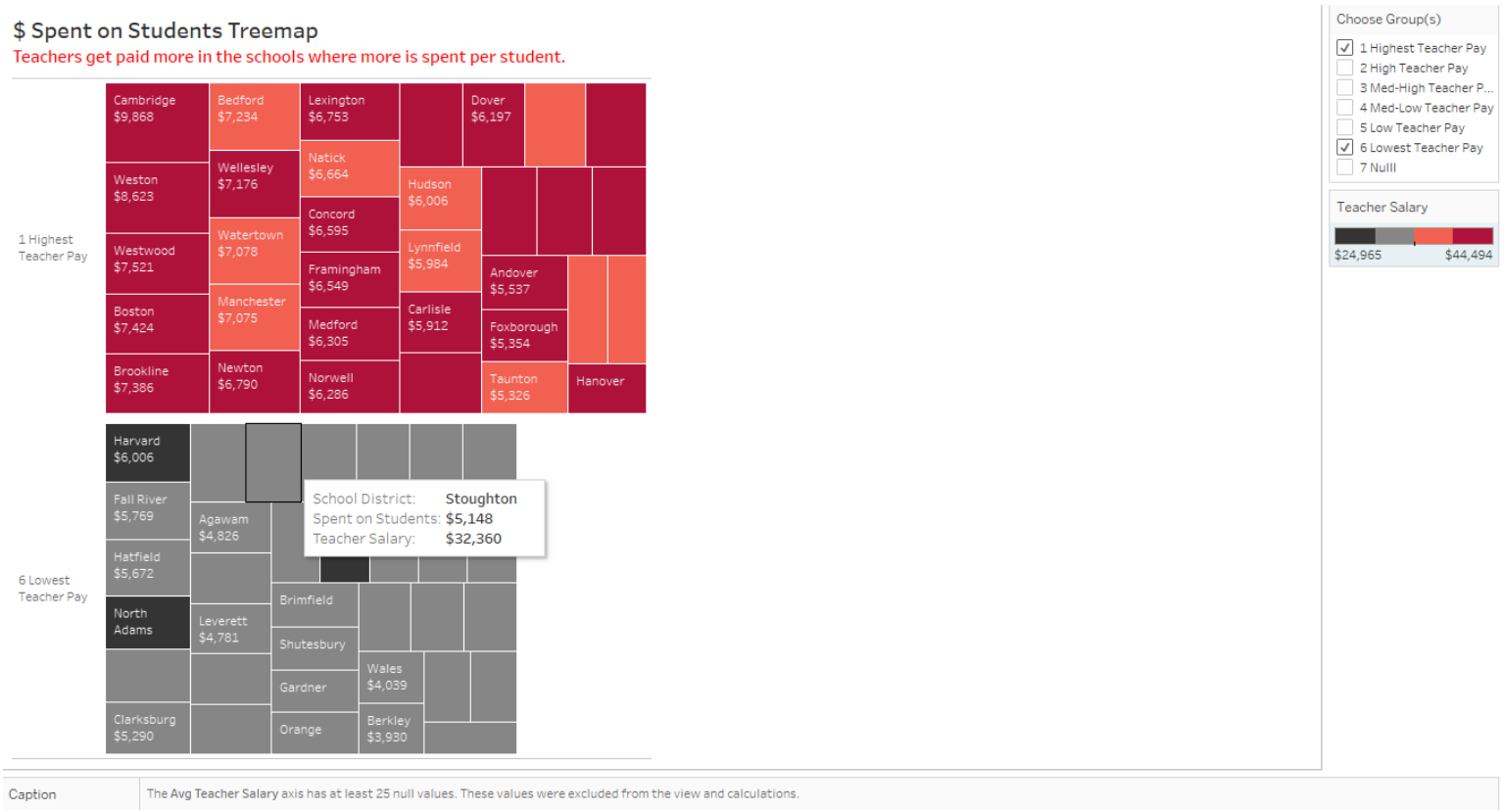
8. Focus was then turned toward Money Spent of Students. Using this Category, I explored a variety of charts and then used the more effective one, with the chosen category, in the Dashboards. This is a Treemap, again showing only the chosen Teacher Salry group selected in the filter and descending sorted order of the $ Spent on Students. It is colored by the range of Teacher Salary but the Tooltip also includes the monetary amounts spent on the Students (this amount correlates with the number of students in a school district, not their demographics or services needed).

   Below, Staunton is a School District with lower Teacher Salary (depicted in light grey) that spends $5,148 on Students, which isn't much less than the $5,326 spent on Students in the "Highest Teacher Pay" Group. The subtite at the top summarizes this well: "Teachers get paid more where more is spent per Student".



Caption: The Avg Teacher Salary axis has at least 25 null values. These values were excluded from the view and calculations.

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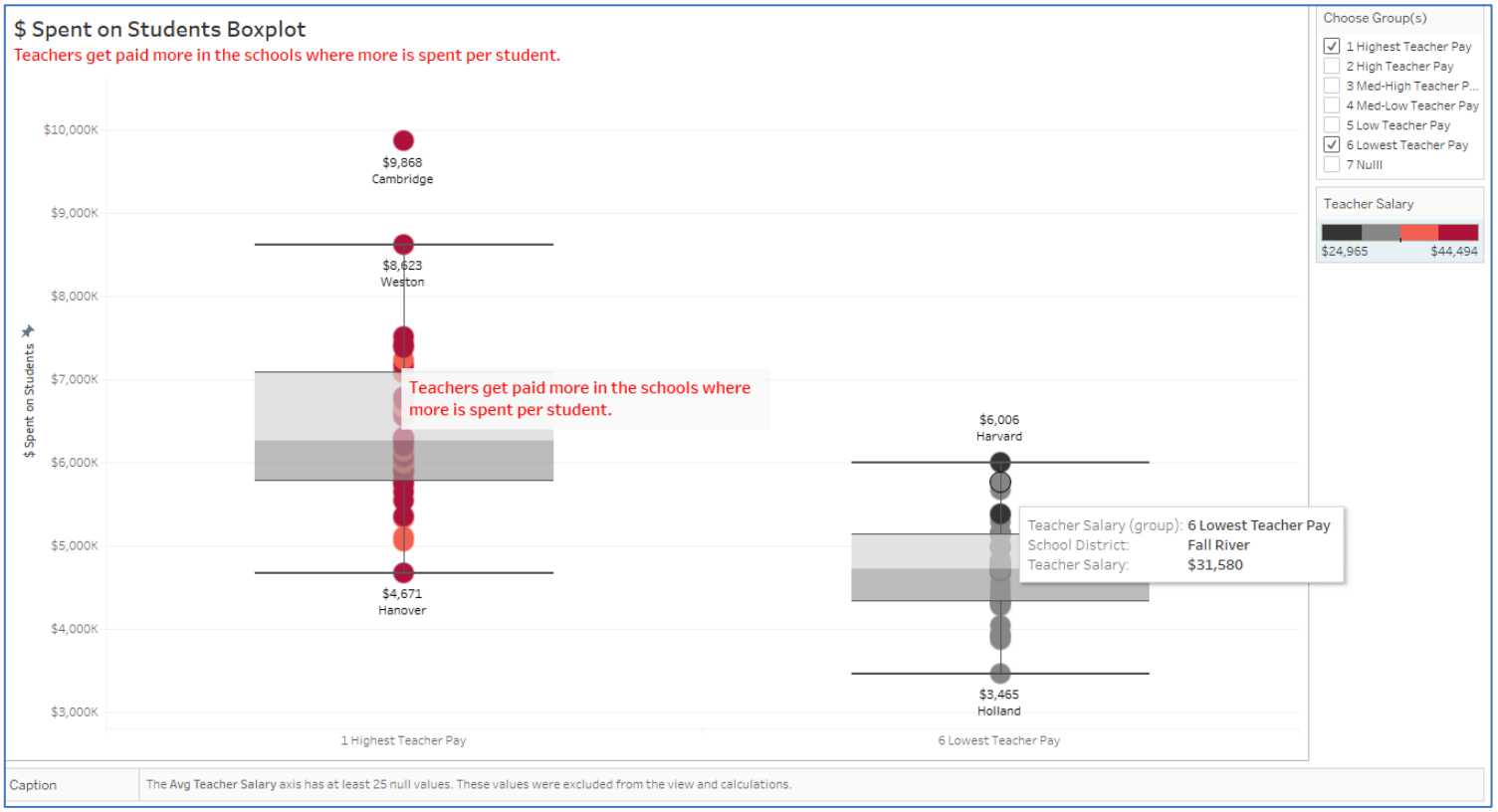
9. I also looked at the same data on Boxplots. The previous $ Spent on Stidents Tree Map, This Boxplot map, and the following Bar chart are all using the same information. I was exploring which chart allowed for more effective messaging. This chart allowed more groups to be placed on the same page, but it was not natural for a viewer to gain insight from.



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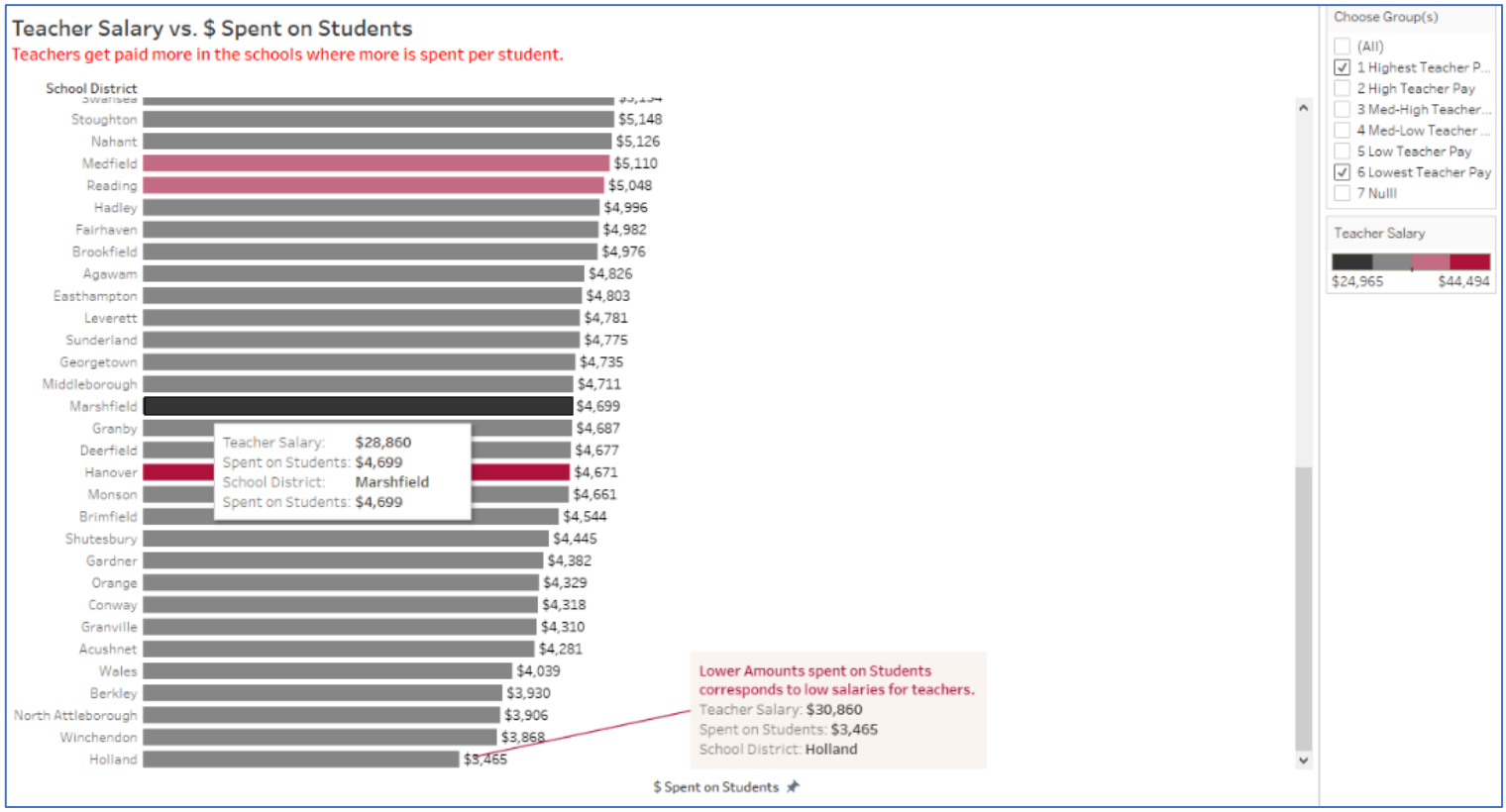
10. Then the same data was turned onto simpler Bar charts. Again, the $ Spent on Students was sorted in decending order. This screen cpture catches the bottom of the chart, where an annotation is placed highlighting that almost none of the pinks and reds are at the bottom of the chart, depicting lower teacher salaries with lower amounts of money spent on students. Using a less ink approach, the scales only have titles but no ticks. The gridlines are gone and simpler color choices are used.



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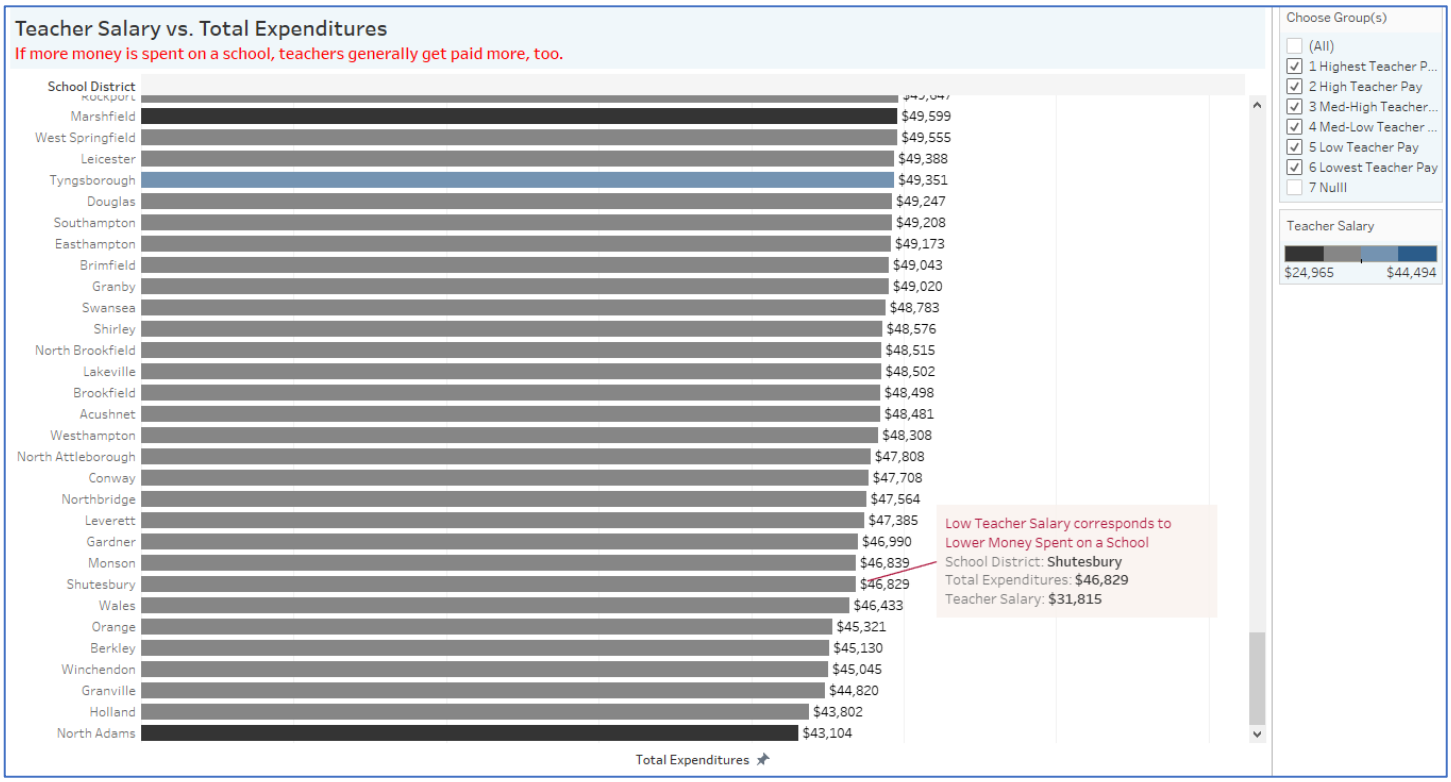
11. The same style of chart was used to look at Total Expenditures compared to Teacher Salaries. The colors were changed to make this chart distinct from the previous chart which was on $ Spent on Students. Looking at the whole data set (not including the Null Values), you can see that most of the values are light or dark grey. This demonstrates lower Teacher Salaries. Since the chart is sorted by descending order of the Value of Total Expenditures, it is clear that the School Districts with higher Teacher Salaries are not at the bottom of this bar chart. The Chart's subtitle states: "If more money is spent on a school, teachers generally get paid more, too".



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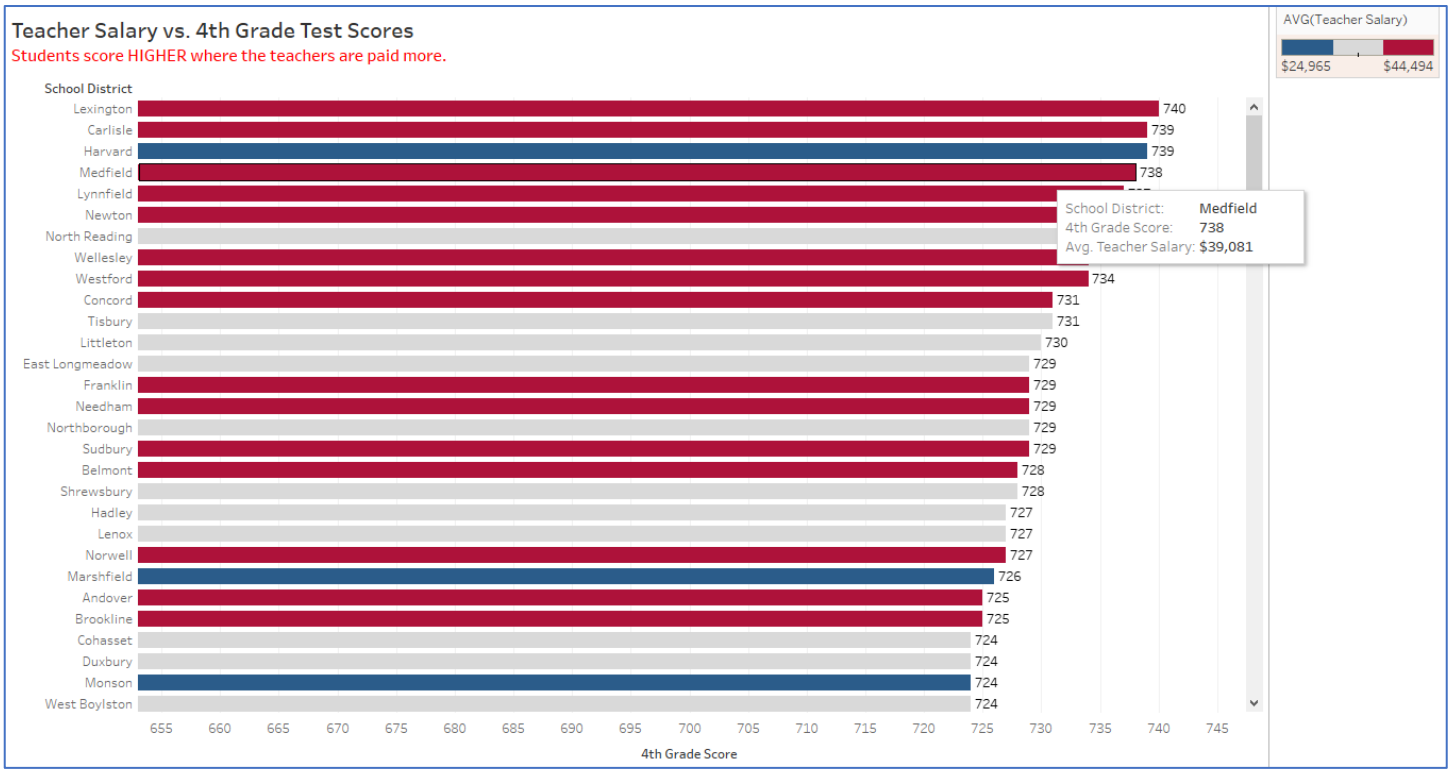
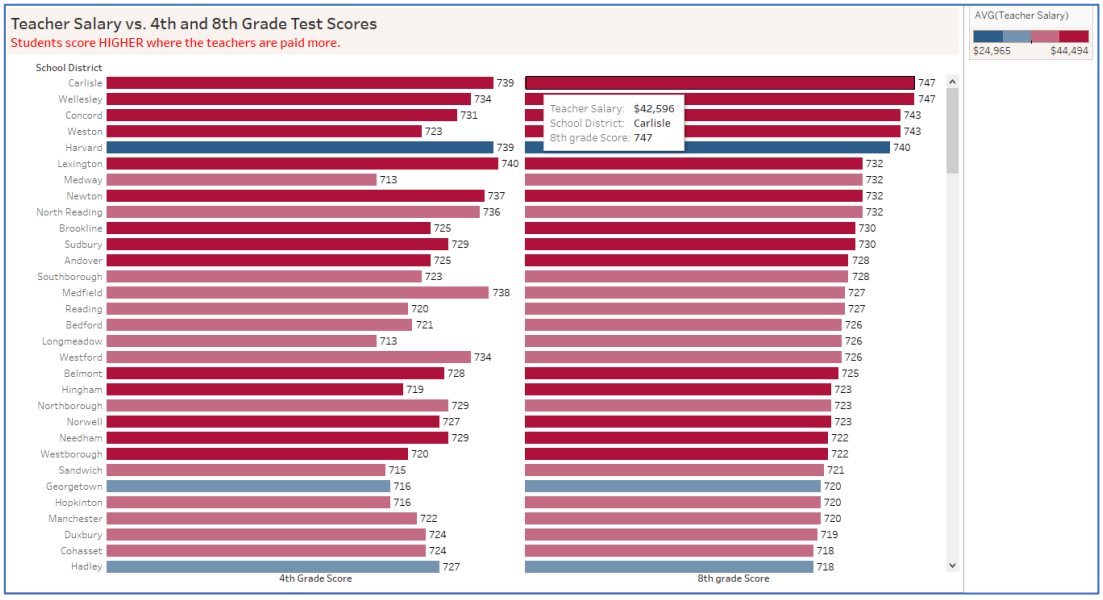
12. The next thought was to apply the same chart to compare how Salary corresponds to Test Scores. Here is a bar chart of descending 4th grade Test Scores colored by Salary Averages. Initially, a 4th grade Test Score was used. I would have loved to get a chart with vertical line bars and a line graph across the bars to show salary and test scores, but this data set did not include any dates or date parts. This screen capture views the top of the chartand the bars are mostly red, showing high Teacher Salaries.



13. Then, the 4th grade was duplicated to become an 8th grade chart. So, I had two charts with similar information. At this point, the chart was neatened up and it was used to put both the 4th and 8th grade scores into one chart. To keep with a more standard 4 color choices, I increased the color legend to 4 color choices. This would be the most important (top-left) chart on my Dashboards and Story Board.



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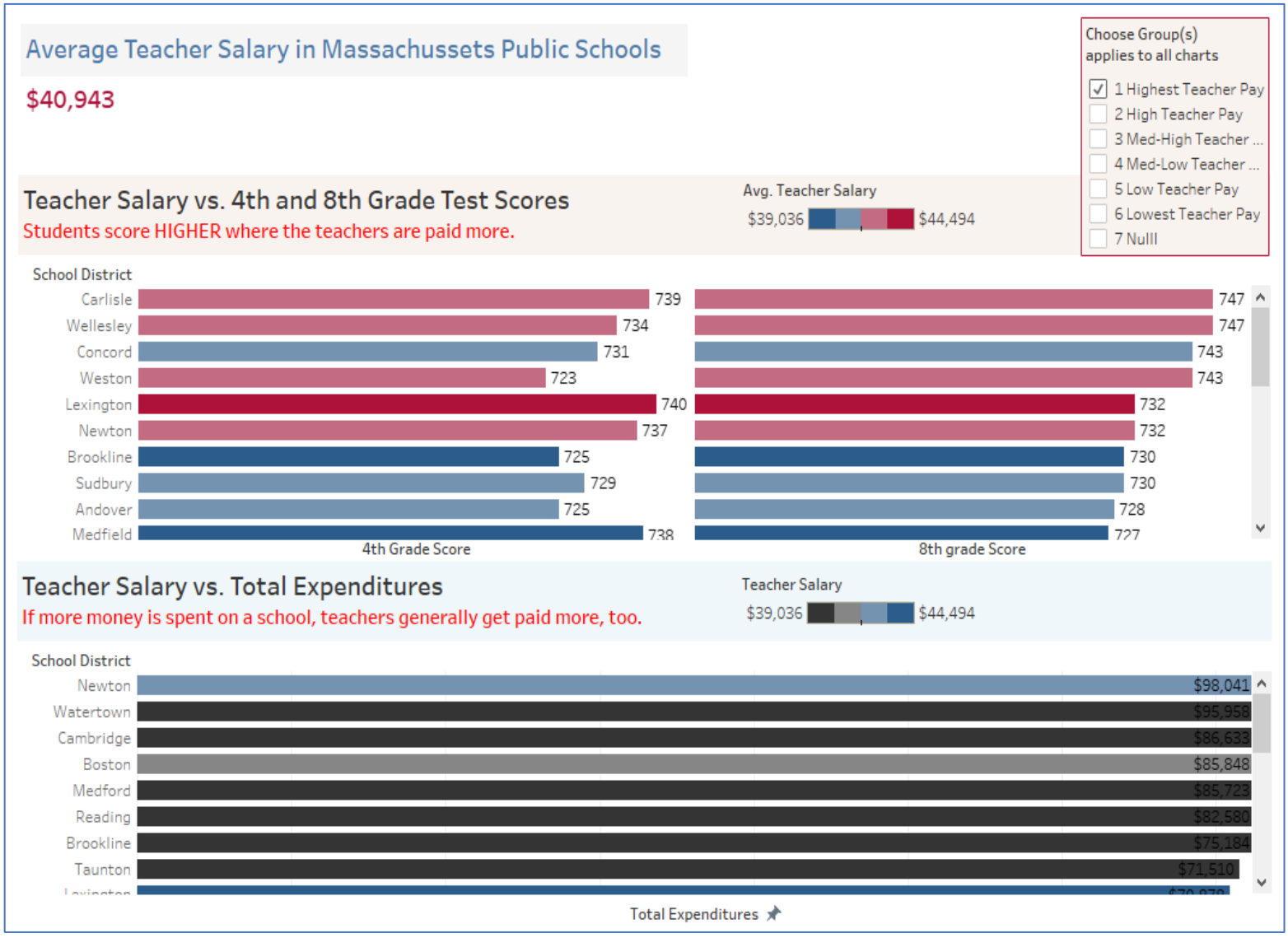
Three Dashboards were Created

1. The 1st and strongest Dashboard describes how the Teachers Salaries compare with Test Scores on the top and on the bottom, describes the whole-part relationship: How much of the total Expenditure is Teacher Salary. There was not room for much annotation with the first chart really showing two charts in one, so the subtitles play a large role in directing the viewer.

   As with all the Dashboards, the Grouping Filter applies to all the data from the original Data set which is the only Dashboard element with an outline. The color scheme is Red, White, and Blue because those are colors that contrast well. To make distinction of the Titles, a subtle shading is present. The uppermost left corner will reoccur on every dashboard and represents the focus on the Average Teacher Salary in Massachusetts. Each Title has a contrasted subtitle to tell the viewer the main point of the charts. The axes have titles but do not have tic marks or grid lines. There are labels on all School District Rows to show numbers to compare to the 4 color Categories of the Average Teacher Salary.



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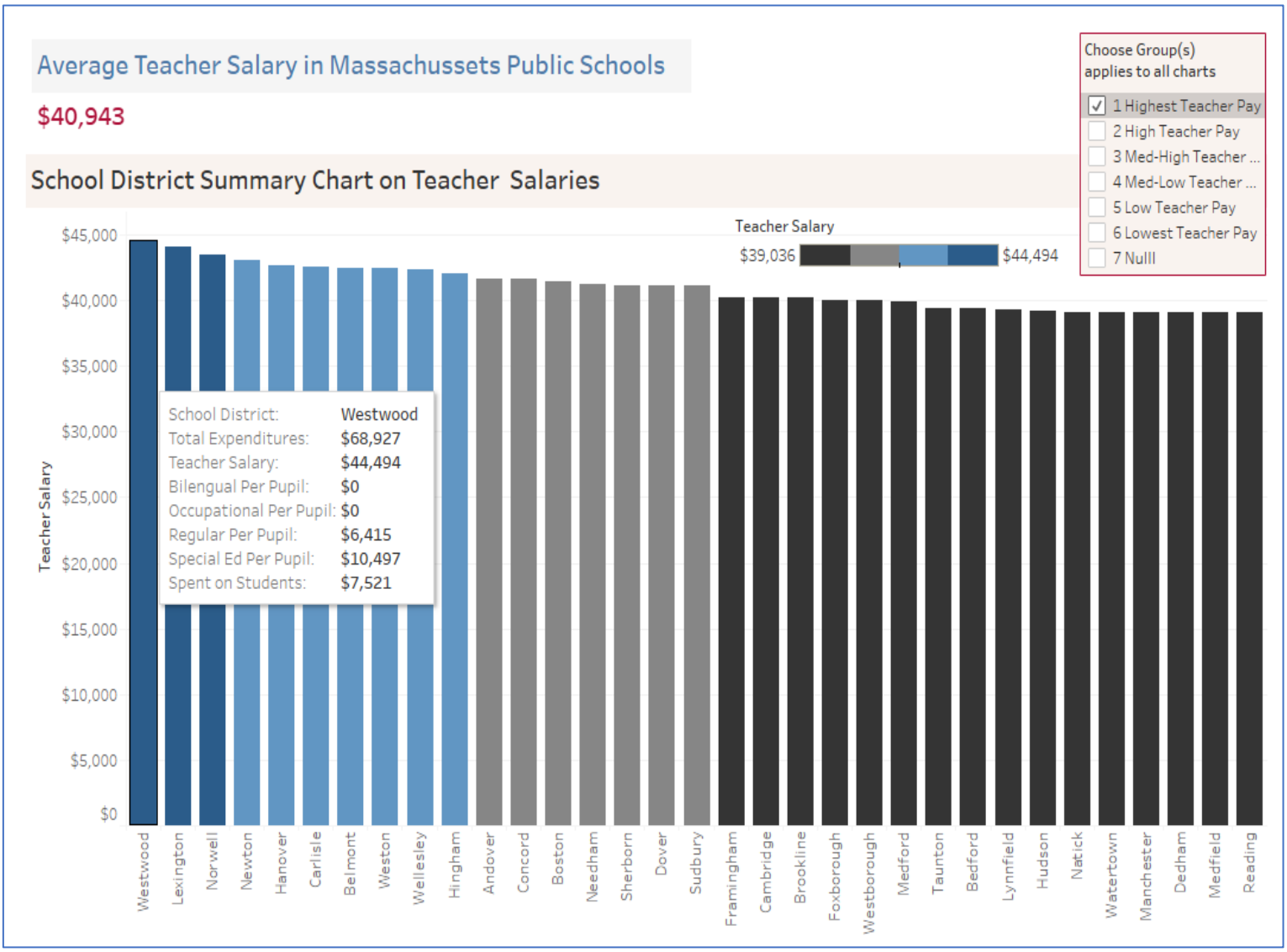
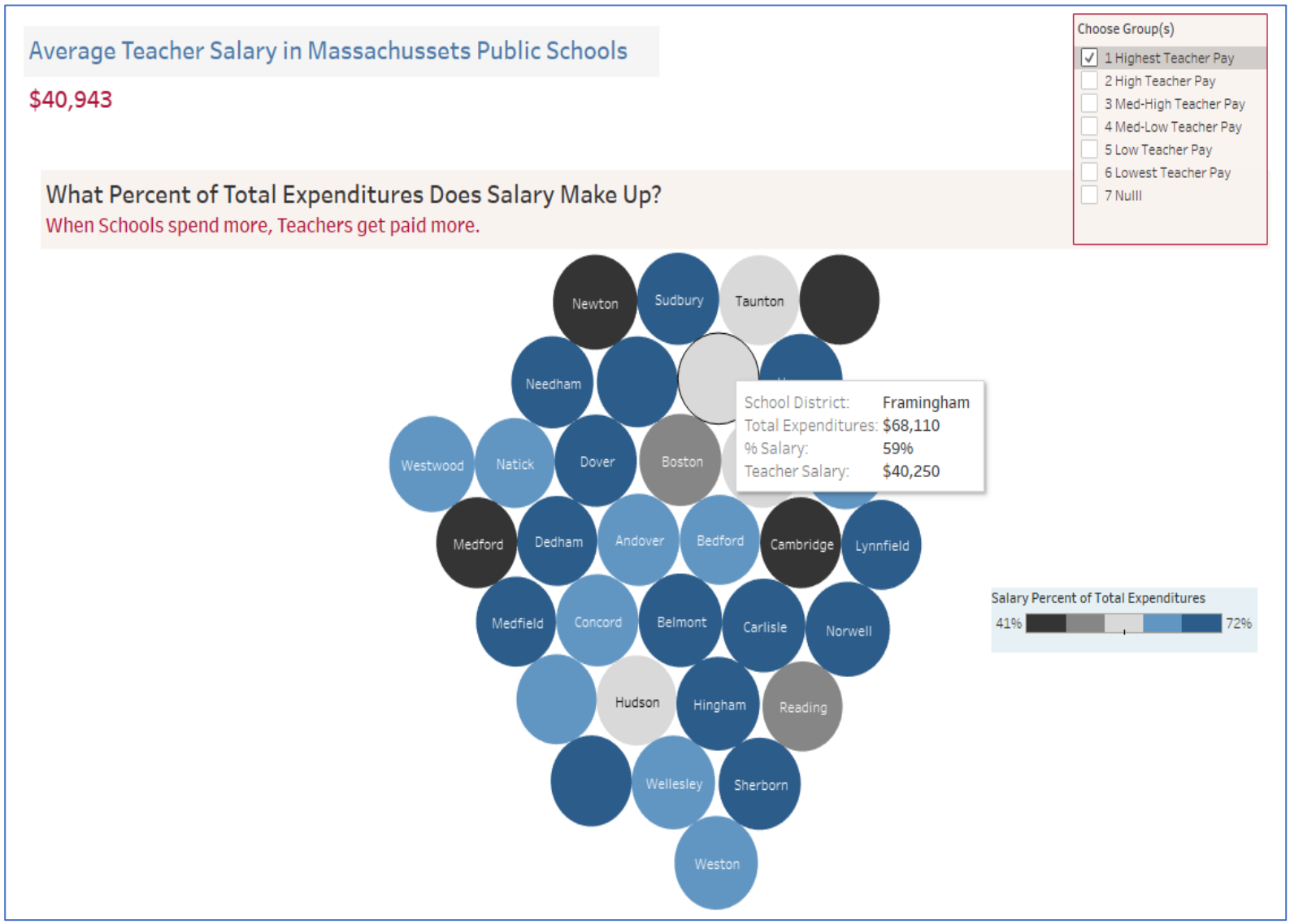
2. This dashboard Summarizes the Average Teacher Salary in each School District. This time there was a light grey horizontal gridline and a labeled Y-axis scale as the bars take up the full screen. Here, the emphasis is on the top of the Highest Teacher Pay Group. All the monetary categories are easily located in the Tooltip including the specific Teacher Salary being represented.

   The color scheme is Red, White, and Blue because those are colors that contrast well. To make distinction of the Titles, a subtle shading is present. The uppermost left corner will reoccur on every dashboard and represents the focus on the Average Teacher Salary in Massachusetts.



3. Then there is a dashboard just for the Bubble chart which needs size in order to be seen well. The tooltip adequately shows the Average Teacher Salary, the Percent that Salary is of the Total Expenditures and the exact value of the Total Expenditures. The subtitle is leading the viewer to a central ides where the higher the Expenditures, the higher the teacher pay will be. Below, this is seen as we see more dark and light blue shades for this single "Highest Teacher Pay Group".

   As with all the Dashboards, the Grouping Filter applies to all the data from the original Data set which is the only Dashboard element with an outline. The color scheme is Red, White, and Blue because those are colors that contrast well.



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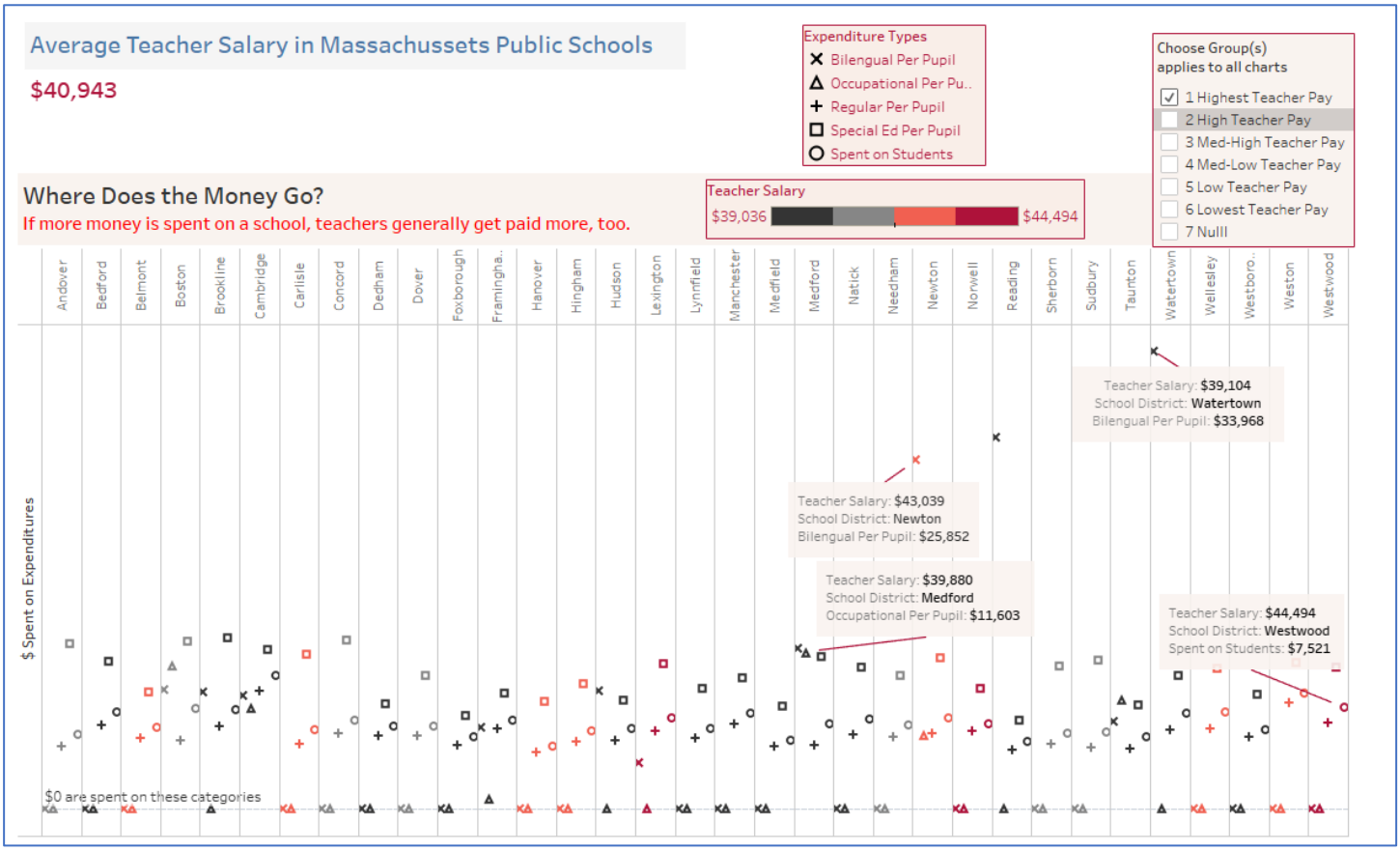
4. The last Dashboard is harder to read because it holds the 5 Expenditure Budget Items and is colored by the Teacher Salaries. The choice was made to have outlined shapes signify these 5 categories. As with all the other charts, the color is aligned with the value range of the Average Teacher Pay. The Actual Average within that range is at the top-left corner with Blue Titling. The top "Highest Teacher Pay" Group has some unique qualities where the Bilingual Expenditures are generally at 0, except for a couple of schools who have a high value for this category (which are annotated). A zero horizontal dashed line is present with a note that $0 is spent on these categories that run along that line. The height of the symbols correspond with higher dollar values in specific categories.



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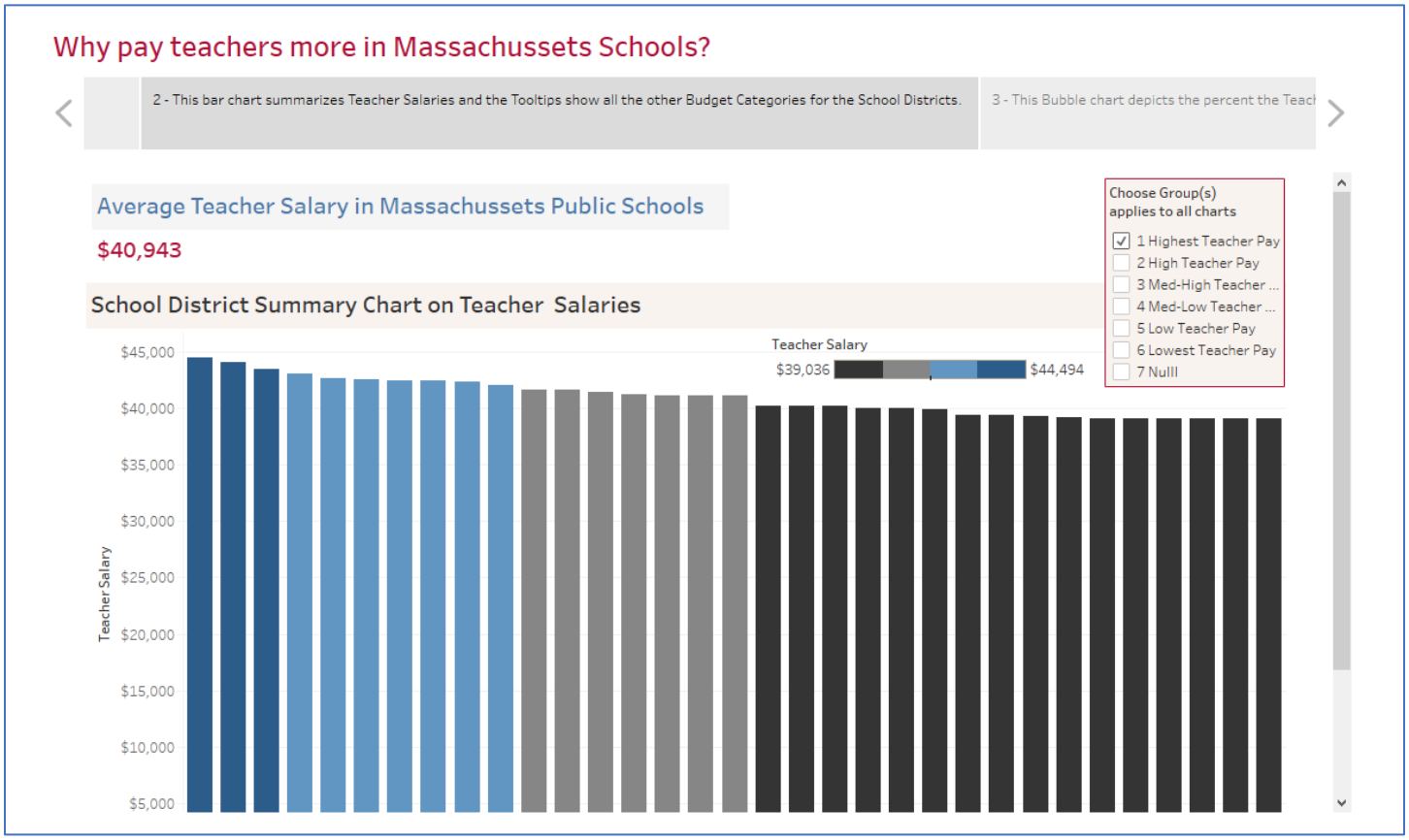
The last item created was a 4-page Storyboard including all the previous four Dashboards. Simple comments above allow the user to change pages. The numbered comments are examples of how that chart might be used. Clicking on each Comment will take you to that corresponding Dashboard.



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