Amee Tan
Python for Data Analysis Final Project
March 31, 2020

5th Grade Student Academic Achievement

Introduction to the dataset

The data used for this analysis comes from the 206 5th grade students I taught in the 2017-2018 and 2018-2019 school year at a Title I middle school in San Jose, CA.

The original dataset included 206 rows and 38 columns for a total of 7,828 entries. Below is a snapshot of the data.

	Year	Gender	Race/Ethnicity	LEP Status	LEP Numeric	Economically Disadvantaged Status	ED Numeric	Language Code	English Language Proficiency Level
0	2017	M	Hispanic or Latino	N	0	N	0	SPA	ADVANCED
1	2017	F	Hispanic or Latino	Y	1	Y	1	SPA	ADVANCED
2	2017	F	Hispanic or Latino	Y	1	N	0	SPA	BEGINNING
3	2017	F	Hispanic or Latino	Y	1	Y	1	SPA	BEGINNING
4	2018	F	Hispanic or Latino	Y	1	Y	1	SPA	BEGINNING

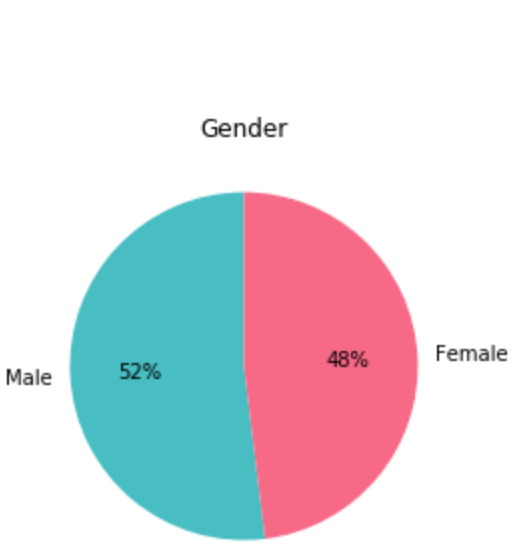
Some of the key data attributes include:

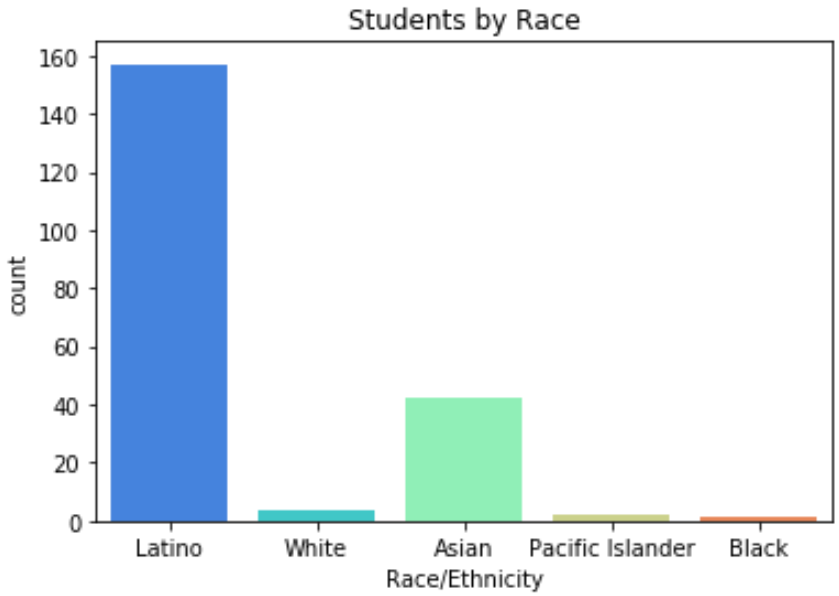
- Race
- Gender
- Primary home language
- English language proficiency level
- Economically disadvantaged status
- 2 different standardized test scores:
    - MAP Test - a computerized adaptive test given to students 3 times a year and is used to measure student academic growth
    - SBAC - California's end of year standardized test

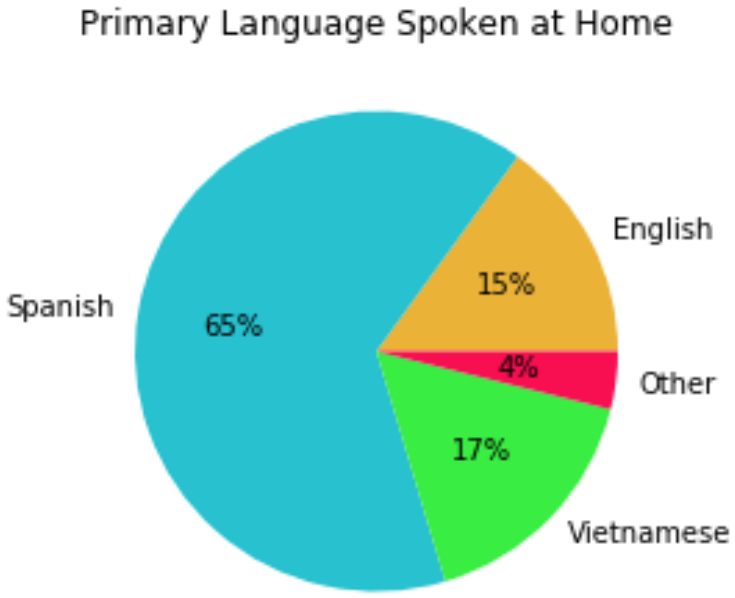
Student demographic breakdown

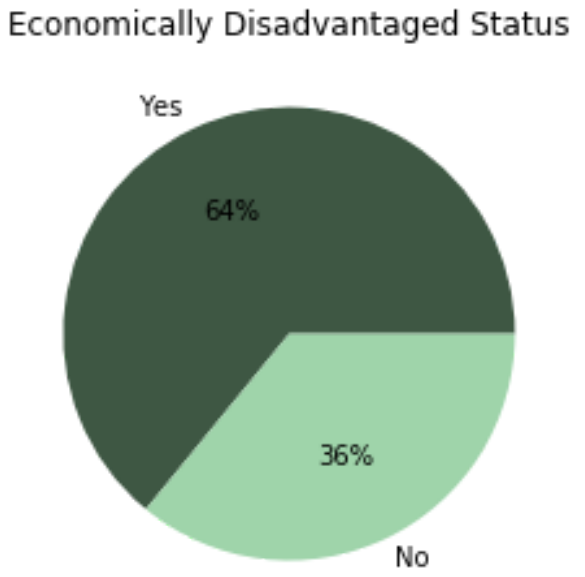
	Gender	Race/Ethnicity	LEP Status	Economically Disadvantaged Status	Language Code
count	206	206	206	206	206
unique	2	6	2	2	10
top	M	Hispanic or Latino	N	Y	SPA
freq	107	157	129	132	133

The figure above shows some of the demographic information about the students. There were more males than females in the sample. The most common race is Hispanic/Latino and the most common home language is Spanish. Most students are not classified as having Limited English Proficiency. Most students are economically disadvantaged.

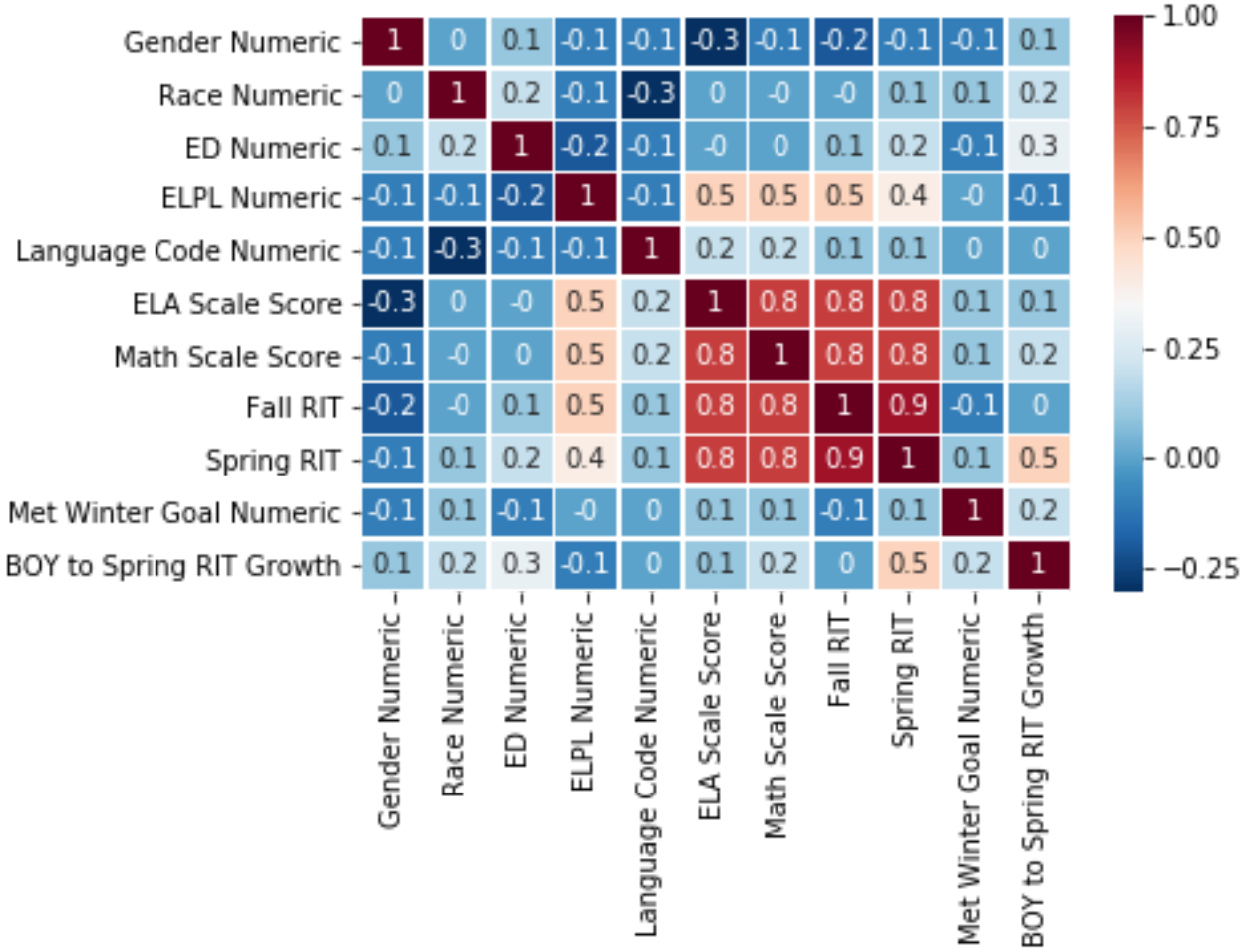








The following heatmap was used to explore relationships between the different attributes.



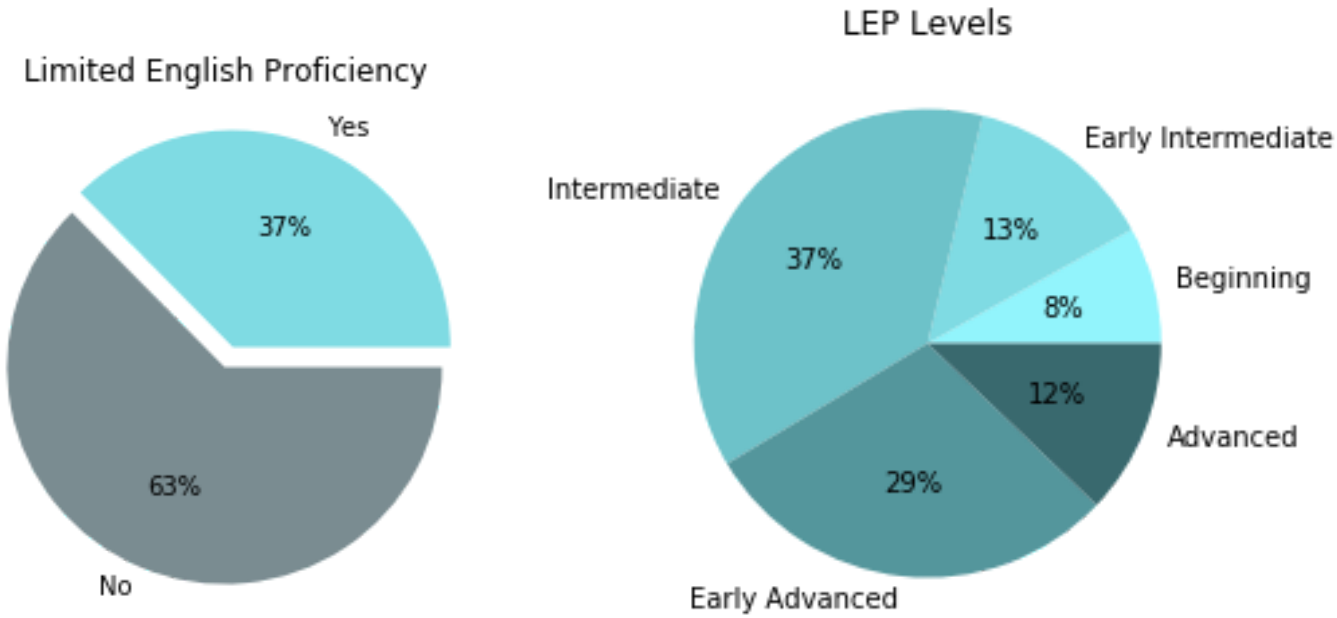
The attributes that were strongly correlated, such as the strong positive correlation between ELA Scale Score and Math Scale score, were unsurprising. If a student scores low on their ELA SBAC, it is likely they will also score low on their Math SBAC. There were a few interesting correlations that needed further exploration including:

- English Language Proficiency Level and Math and ELA scores
- Gender and ELA score
- Gender and Fall RIT score
- Economically Disadvantaged Status and BOY to Spring Growth
- Race and Economically Disadvantaged Status
- Race and BOY to Spring RIT Growth

After viewing the correlation heatmap, a few questions needed further exploration:

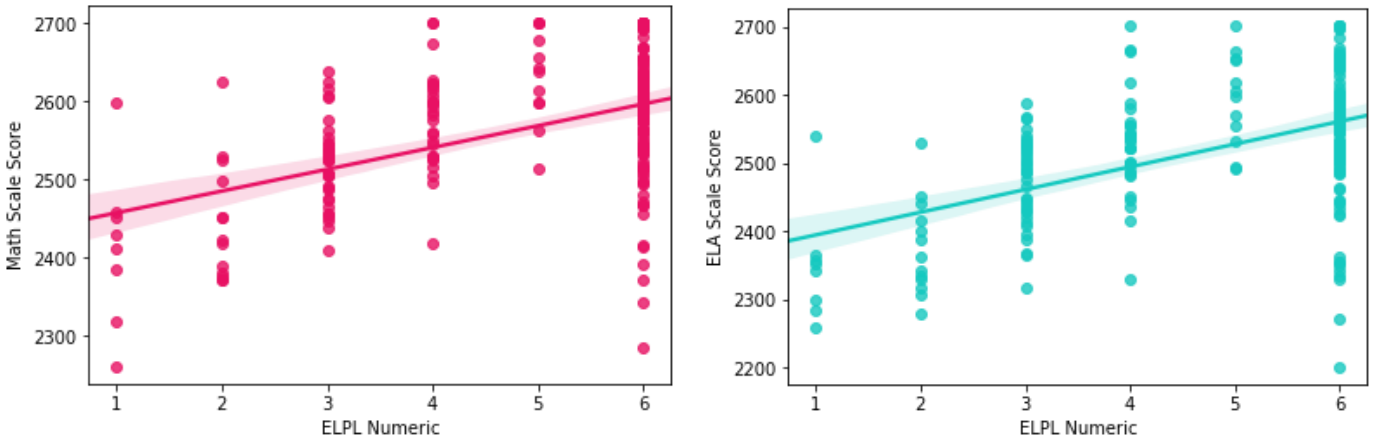
1. What is the relationship between English Language Proficiency Level and academic outcomes?
2. What is the relationship between Economically Disadvantaged Status and academic outcomes?
3. What is the relationship between race/ethnicity and academic outcomes?
4. What is the relationship between gender and academic outcomes?

What is the relationship between English Language Proficiency Level and academic outcomes?

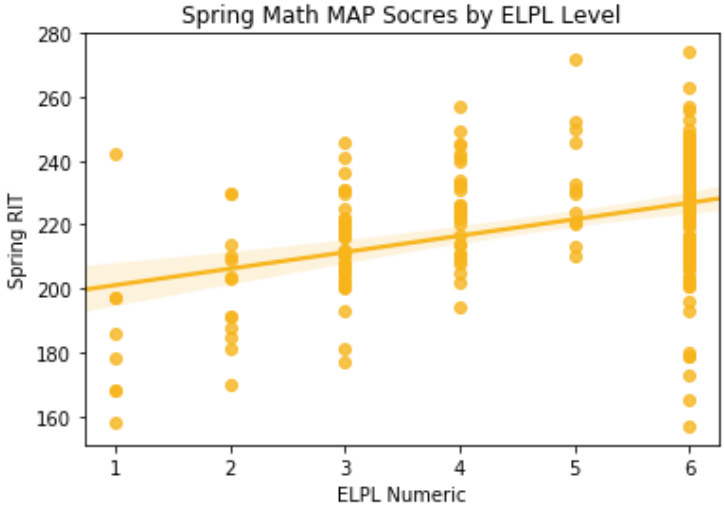


Student English Language Proficiency is measured by the English Language Proficiency Assessments for California (ELPAC) test. The test is given annually to determine the level of English language proficiency of students who are limited English proficient (LEP). It also assesses the progress of LEP students in acquiring skills of listening, reading, speaking, and writing in English. The figure on the left above illustrates that 37% of students are classified as having Limited English Proficiency. The figure on the right shows the LEP levels of those students.

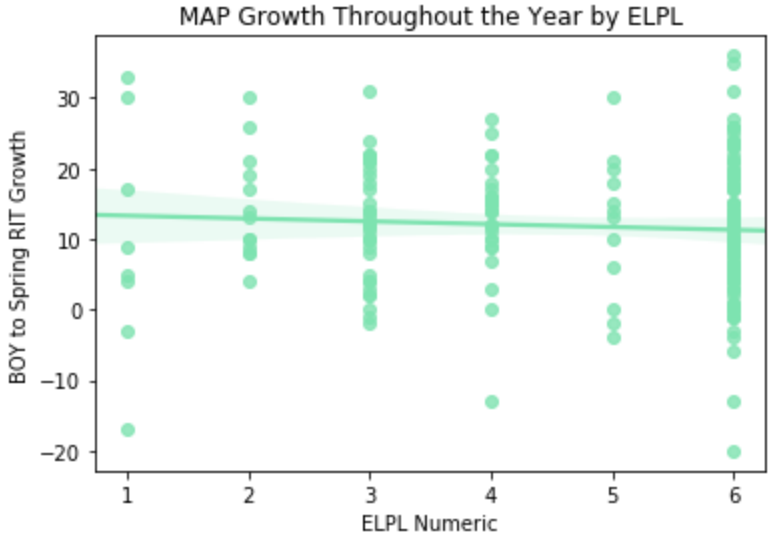
Unsurprisingly, there is a relationship between a student's English Language Proficiency Level (ELPL) and their scores on the Math and ELA SBAC test. The higher the student's ELPL, the higher they tend to score on the SBAC.



There was also a positive relationship between ELPL level and Math MAP score, but the relationship was not as strong. This could be due to the fact that the Math SBAC involves more word problems and tests student's ability to communicate mathematical reasoning whereas the Math MAP tends to be more computational.



ELPL showed a small effect on student growth throughout the year. It is encouraging that students with lower ELPLs are showing as much or more growth as the students with higher ELPLs. However, in order to be on grade level, those low-level students need to be making more growth in order to catch up with their peers in a timely manner.

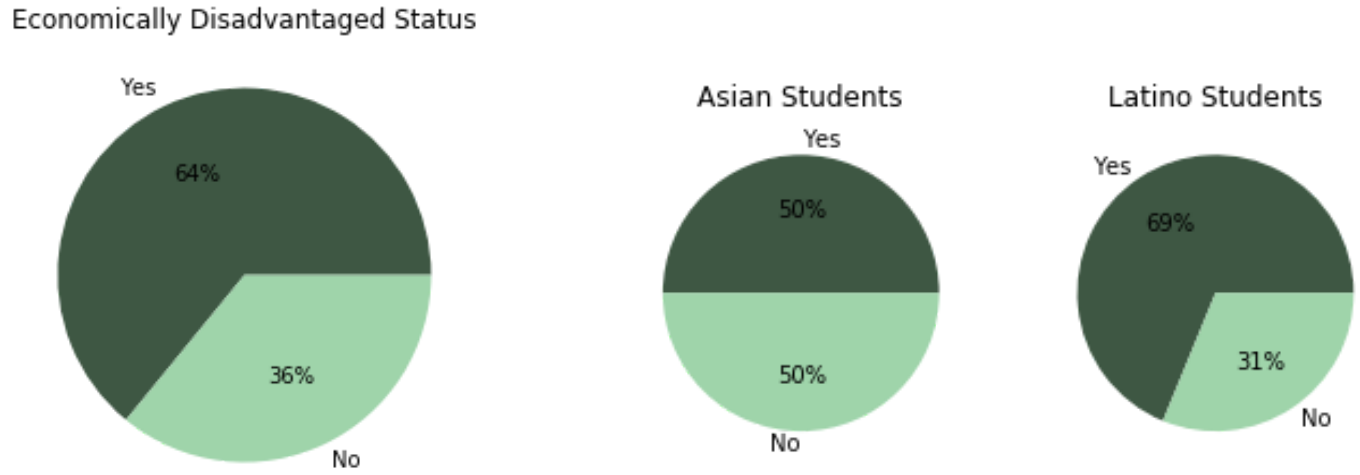


What is the relationship between Economically Disadvantaged Status and academic outcomes?

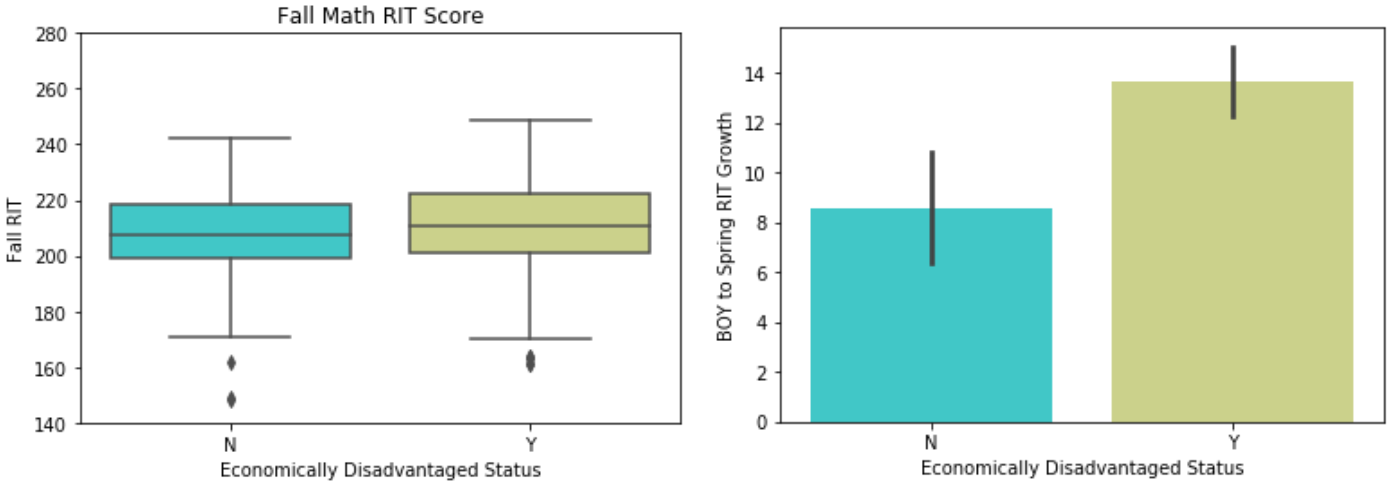
In order to be classified as ED, students must meet either one of two criteria:

- Neither of the student's parents has received a high school diploma
- The student is eligible for free or reduced-price lunch program

64% of students are economically disadvantaged (ED). When looking at the two largest demographic groups at the school, there are a greater proportion of Latino students who are classified as ED than Asian students.



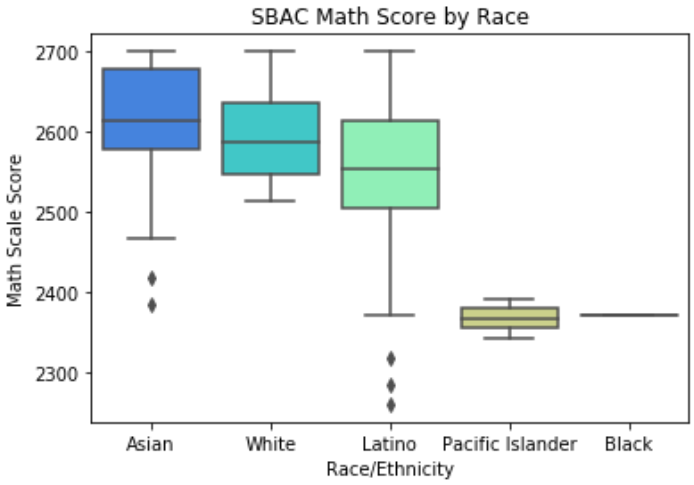
The relationship between ED status and academic outcomes was surprising. Based on research, students who are ED tend to not perform as well as students who are not ED. The results from my school showed the opposite. Students scored about the same, regardless of ED status, on the Fall Math MAP test. Students who were ED also grew more throughout the school year. It is encouraging to see that my ED status does not appear to be a factor in student academic achievement at my school.

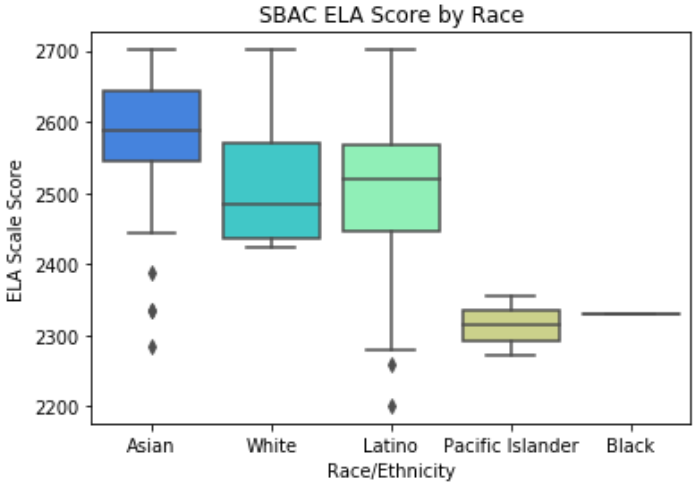


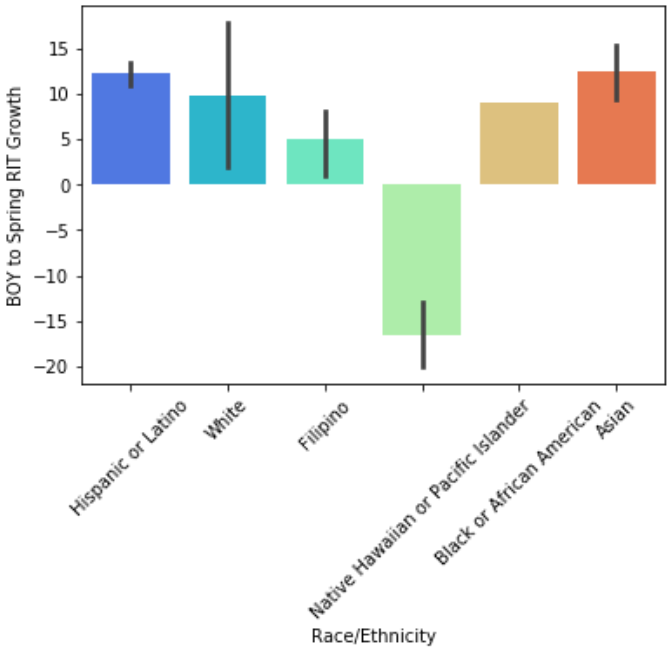
What is the relationship between race/ethnicity and academic outcomes?

Race/Ethnicity	BOY to Spring RIT Growth	Math Scale Score	ELA Scale Score
Asian	12.4	2612.7	2573.9
Black or African American	9.0	2372.0	2329.0
Filipino	5.0	2582.3	2523.7
Hispanic or Latino	12.3	2548.9	2506.4
Native Hawaiian or Pacific Islander	-16.5	2367.5	2313.5
White	9.8	2597.0	2522.8

Asian and Hispanic/Latino students showed about equal growth throughout the year. However, Asian students still scored about 65 points higher on the SBAC Math and ELA. The Black/African American students and Native Hawaiian/Pacific Islander students are of the greatest concern, scoring significantly lower than other students. Student growth throughout the year also varies by race, but the reasons why are still unclear.

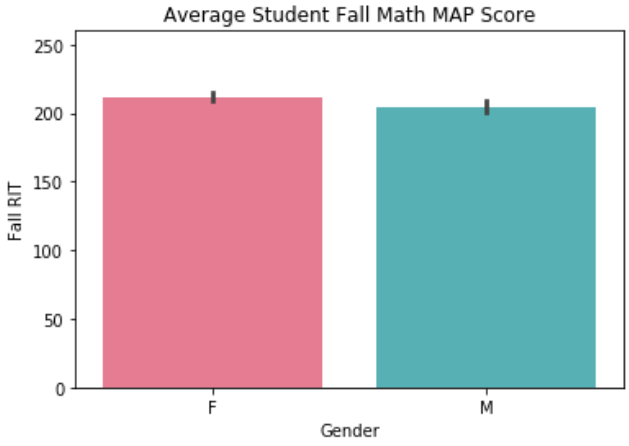


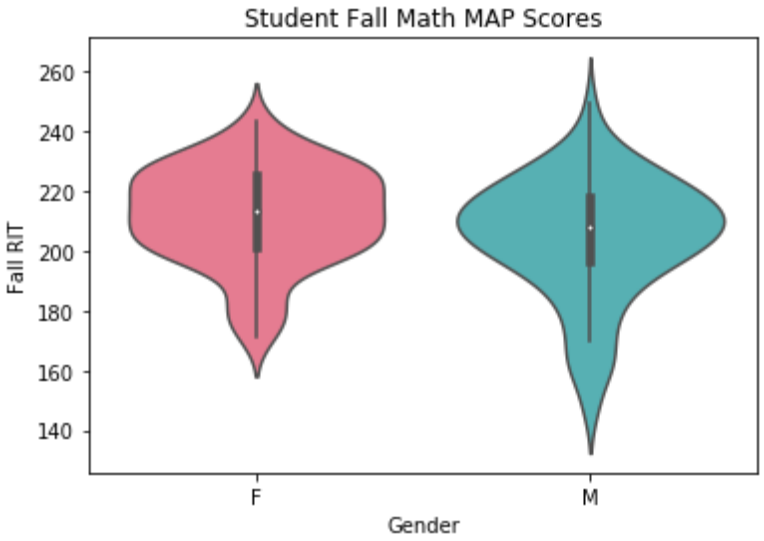




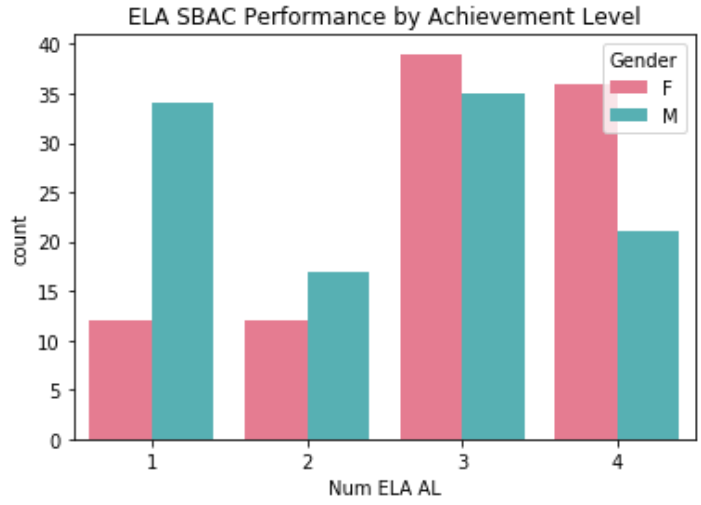
What is the relationship between gender and academic outcomes?

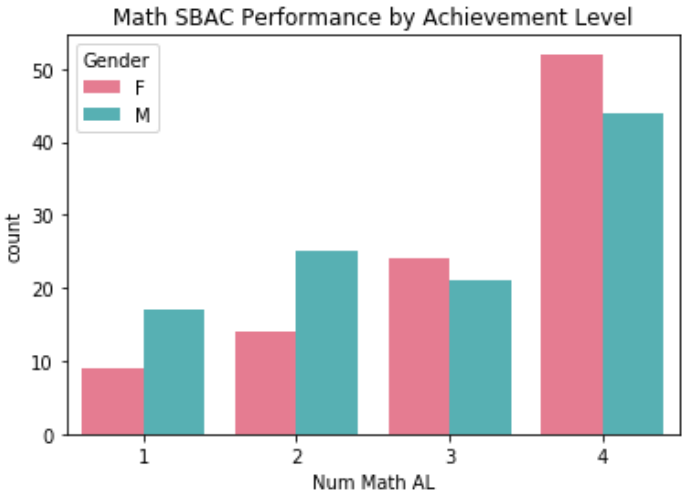
At the beginning of the year, male students had a slightly lower average Math MAP score than male students. There is also a wider range of scores for male students than female students. It is important to note that there are a greater number of male students starting the school year with significantly below average scores.



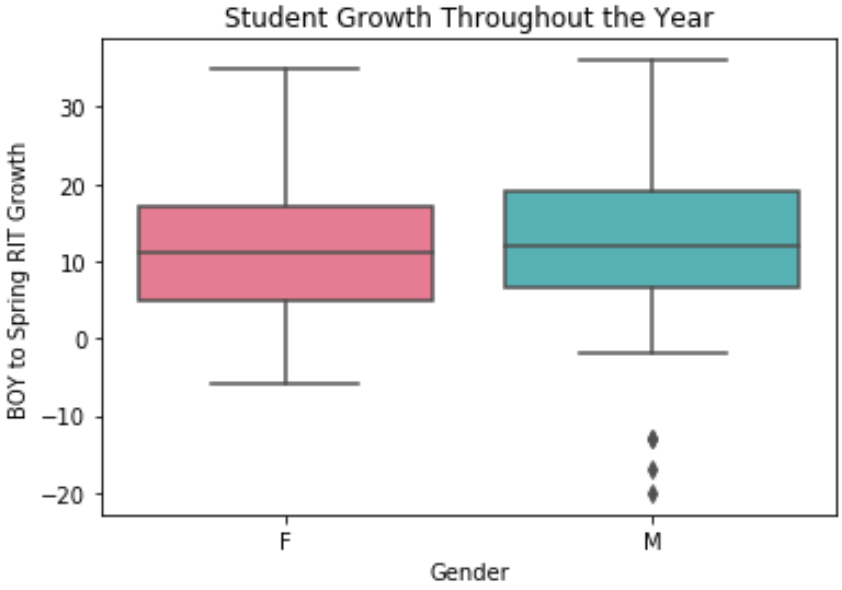


At the end of the year, there was a surprising disparity in performance between male and female students. More girls scored at or above grade level (score of a 3 or 4) whereas more boys scored below grade level (score of a 1 or 2) on both the ELA and Math SBAC. This was a gap that I was previously unaware of and the reasons why this gap exists need to be examined further.





One reassuring finding was that boys did show more growth, on average throughout the school year. However, there are still a number of concerning outliers within the male group of students who actually regressed from the beginning to the end of the year.



Conclusions

As a result of this analysis, there are a few recommendations I have for our school leadership team. First, the school needs to focus on better monitoring the academic progress of male students. We already know that males are disproportionately disciplined and are working to decrease that disparity, but we also need to be mindful of the academic achievement gap that was illuminated in this analysis. Second, we need to continue supporting the English Language development of LEP students. The connection between academic performance and ELPL is clear and one that needs continual attention. Finally, more data is needed to determine the reasons why male students are not performing as well as female students and why Latino students are not performing as well as Asian students.

References

Information about the ELPAC: https://www.cde.ca.gov/ta/tg/ep/

Information about the MAP test: https://www.nwea.org/map-growth/

Information about the SBAC: https://www.cde.ca.gov/ta/tg/sa/

SBAC Language Codes: http://www.caaspp.org/rsc/pdfs/CAASPP.student_data_layout_v2.2019.pdf