Student Performance on Exams

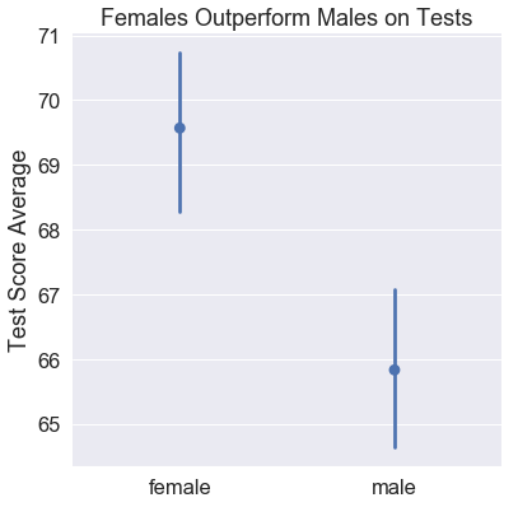
Background

Frequently the topic of discussion in academia, factors influencing student performance on exams are paramount to helping students succeed. This dataset supplied information from high school students on student gender, ethnicity, parental level of education, whether they received a 'free/reduced' lunch or had a standard lunch, and scores for math, reading, and writing exams. As the total average is more of interest than the individual topic of study, I averaged the three exams for ease of seeing trends in other factors.

Investigation into Factors Influencing Test Average

Gender

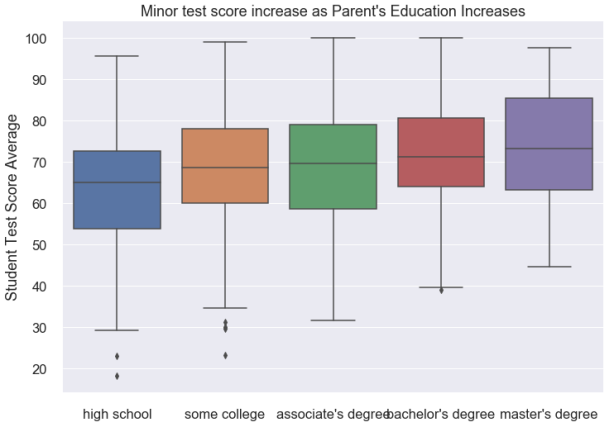
A look into gender revealed a statistical significance between females and males with females outperforming their male counterparts by over 3.5% on average. This information is of interest, but other analytics would be important to have for further delving into gender and learning. Age, specifically, would be important to note.



Additionally, while experiments can be done to isolate factors allowing females to perform better than males on exams, changing student gender is a highly expensive and unethical process. Therefore, a look at other factors influencing test performance is crucial.

Parental Level of Education

Parental level of education was also looked at to determine its influence on student test performance. With overlapping box plots, there is a fair amount of variance in this data set. Seven of the ten comparisons between parental education levels revealed significant differences in student test scores, reflecting increased scores for increased parental knowledge.



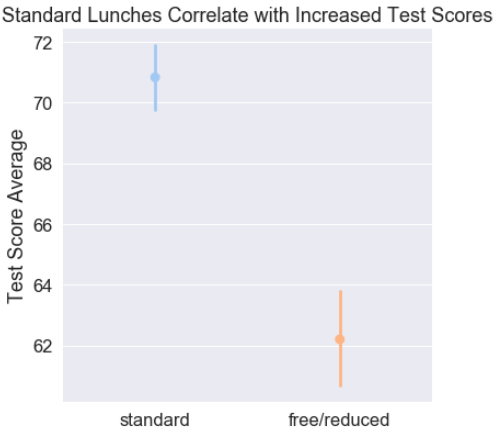
Unfortunately, as with gender, student's do not have control over their parent's education, but this would be an interesting factor to explore for options to level the playing field.

Table: p-values between varying levels of parental education

	High school	Some college	Associate's	Bachelor's
Some college	6.17e-05			
Associate's	1.6e-06	0.3987		
Bachelor's	6.4e-08	0.0284	0.13421	
Master's	3.6e-07	0.0109	0.04490	0.44858

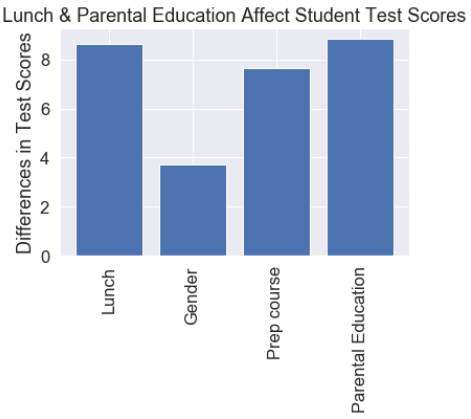
Lunch

Looking at lunch options, a significant difference is seen between students receiving free/reduced lunches vs students that have the standard, bring your own lunch/pay for lunch option. The difference here is over 8% with students under the standard category scoring higher than the students with the free/reduced lunch. This could be more of a socioeconomic issue than a lunch issue, but we can do an experiment to analyze this.



Test Preparation

Students taking a test preparation course outscored students who did not on average by a little over 7.6%. In comparison to the factors of lunch and parental education, this shows slightly less importance for student performance on tests, but can also be investigated further by analyzing factors like the type of prep work done by the students and how close did they take the course in relation to the test date.



Experimentation

As our analysis shows, lunch and parental education are the leading factors in student success on tests. While tests can be performed to further delve into why parental education has such an effect on student performance, a more controllable factor is student lunch. We therefore propose an experiment to better understand if the quality of lunch effects student test scores. This leads us to our question:

Will increasing health of lunch effect test scores?

We hypothesize that increasing the nutritional value of provided lunch will result in higher test scores. This will be beneficial to both the students paying the lunch and those receiving the lunch for free. We can also make a comparison to students bringing lunch from home, although a nutritional assessment cannot be done on these lunches without some sort of survey option.

Experimental Design

We will randomly assign a sample of 500 students to a group receiving the classic 'free/reduced' lunch that they have been receiving and label this Group A. Group B will be a random assortment of students that have a meal with reduced sodium, increased protein, and more fruit/vegetables. After two weeks of this lunch treatment, we will have students take a similar, three category test and compare the test averages.

Benchmark

If students with healthier lunch increase test scores by 2%, we will continue experiment for one month. If students with healthier lunches score 4% higher after 1 month, this cuts the discrepancy in half and can therefore be labeled a success.