



# Influence of School District Diversity and Socio-Economics on Racially Disaggregated Student Test Scores

Neel Rao, Sam Spinner, Gina Valderrama  
Stanford University Department of Computer Science

## Abstract

Our project investigates the relationship between racially disaggregated student performance outcomes and demographic characteristics of school districts across the United States. We hope to better understand the questions:

1. Which demographic features are **most predictive** of student outcomes, and therefore **most deserving of resource allocation/societal attention**?
2. What is the relationship between **socioeconomic status (SES)** and student performance?

In doing so, our project will allow educators, local and federal governments, and school district boards to better student performance. We hypothesize that demographic factors are, unfortunately, very predictive, regardless of variation in school effectiveness. In particular, socio-economic percentages should be the most predictive, based on findings in the educational literature.

## Data

### Background:

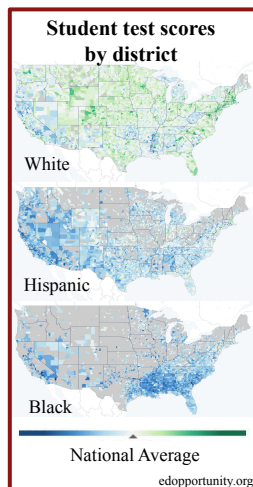
Stanford Education Data Archive (SEDA) is a research initiative by the Educational Opportunity Project at Stanford that aims to harness educational, demographic, and economic data to improve educational opportunity for all.

### Datasets:

- District test scores, grades 3-8
  - Score indicates deviation from national average
  - Includes subgroup scores (by race, gender, SES)
- District covariate data
  - Diversity index, poverty rates, unemployment, etc...
  - Subgrouped by race

### Processing:

- Joining the tables by district resulted in 90 separate measures per ~13,500 districts over 8 years and various grades. We then selected features that existing literature suggests could have high impact on student performance
- **Feature examples:** socioeconomic status, rate of single motherhood, SNAP receipt rate, rate of unemployment, poverty rate, racial diversity
  - Resulted in ~900,000 examples of length 50

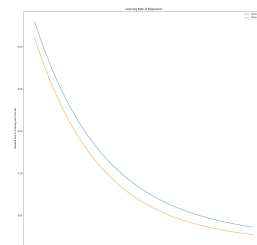


## Approach, Challenges, Results

We model a percentage of student success as a linear function of the demographic factors that make up a student's immediate environment. To explore which factors have the most influence over student success, we implement a **linear regression model** trained on school district data for black, hispanic, and white students. Our batch size for the regression ranges from 50,000 to 100,000 samples, and as such balancing stability with expressiveness was a significant challenge. Ultimately, each student group needed individually tuned hyperparameters.

The regression model was trained on 90% of each batch and tested on the remaining 10% of the batch to tune hyperparameters. The model was trained for a number of iterations that minimized the squared loss on the testing set. After the weight of the different factors were calculated multiple times to ensure consistency, we analyzed the factors that most positively or negatively influenced student achievement.

	Black Students	Hispanic Students	White Students
Positive Predictors	SES, black % Higher Education, all	SES, hisp % Higher Education, all	SES, white % Higher Education, all % White students
Neutral	Relative Diversity Index, Black/All Poverty, White	Relative Diversity Index, Hispanic/All % Food Stamp Recipients, All	% Students English Language Learning Relative Diversity Index, White/Hispanic
Negative Predictors	% Students English Language Learning Difference Between SES, White/Hispanic Difference between SES, White/Black	% Students English Language Learning Log median income, All * Difference Between SES, White/Hispanic	Relative Diversity Index White/Black Difference between SES, White/Black



Consistently positive predictors



Consistently negative predictors



## Analysis of Findings

Recent research from Sean Reardon and others at the Educational Opportunity Project have found that **income-level is most predictive of student outcomes**. Our results corroborate these findings, using different statistical methods. Additionally, our findings show that the **larger the gap between the socio-economic status** of white and minority students within a school district, the **worse all students perform**. The amount of **educated individuals** (Bachelor's degree or higher) within a community is **positively correlated to student success**. Financial inequality does not benefit any significant portion of students.

Our results **cast doubt upon commonly held American principles**, such as the notion that wealth inequality can be corrected over time by public education. Instead, reducing poverty and increasing the socio-economic equality across all demographic groups would seem to be the best approach.

Lastly, although our model suggests that school integration seems to have a negative effect on white student test outcomes, we are hesitant to discount diversity. The breadth of education research shows that diversity benefits all students, so we think our results may have more to do with the fact that white families are often wealthier, so their schools have more funding.

## Policy Recommendations

Our findings support the following courses of action for both lawmakers and school districts.

### Government Officials:

- Work to improve the SES of constituents without relying on the education system.
- Increase access to higher education for all constituents.

### School District Boards

- Distribute funding more equitably among schools to decrease the impact of SES disparities.
- Invest in Pre-K programs, after-school tutoring/daycare, and educational summer camps, all effective resources that low-SES students lack access to.

## Acknowledgements & Sources

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