Short Research Report Summary

Abstract
This report looks at how social, economic, and emotional factors affect students' reading scores in Türkiye using the PISA 2022 data. This report uses a multiple linear regression model incorporating all ten plausible values (PV1READ–PV10READ) and final student weights (W_FSTUWT) to improve accuracy and representativeness. The analysis shows that students tend to do better in reading if their mothers are more educated, they have more books at home, and they feel a stronger sense of belonging at school. School type and gender also play a role. After applying the correct weights and using all plausible values, female students scored higher than male students, which matches the official results from the PISA 2022 national report. This study shows how important it is to follow proper statistical steps when working with large educational datasets.

Introduction
This study looks at what affects Turkish students' reading performance based on PISA 2022 data. It focuses on how socio-economic status, family background, and emotional factors relate to their scores. By using a detailed regression model, the study aims to give a clearer picture of what influences reading success.

Methodology
Dataset: PISA 2022 (Türkiye subset)
Software: R (RStudio)
Sampling: Not applicable (Full Türkiye subset used with weighting adjustments)
Variables:
Dependent Variable: PV1READ (Reading performance)
Independent Variables: Book count, parental education, gender, school type, emotional indicators (BELONG, FEELSAFE, etc.)

Weights and Plausible Values
To make sure the results represent the whole student population, all 10 plausible values for reading scores (PV1READ–PV10READ) were used in the regression analysis. Final student weights (W_FSTUWT) were also included to improve accuracy.
The analysis was done in R using the mice package to combine the plausible values with multiple imputation. This method improved the gender-related results as well — showing that female students perform better in reading, which matches the official PISA 2022 report for Türkiye.

Statistical Techniques:
Descriptive analysis
Correlation matrix
Multiple linear regression (Model 5)
Residual diagnostics (normality, homoscedasticity)

Findings
- **Book Count (recoded) → Positive effect (Beta = +7.99, p < 0.001)**

What it means: Students with more books at home tend to score higher in reading. Access to books encourages reading habits and strengthens academic performance.

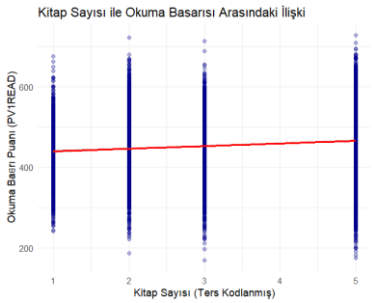

Figure 1 Relationship between Book Count and Reading Performance (PV1READ).

- **Mother's Education → Strong positive effect (Beta = +82.21, p < 0.001)**

What it means: Students whose mothers are more educated perform significantly better in reading. Maternal education plays a crucial role in shaping learning environments and supporting academic development.

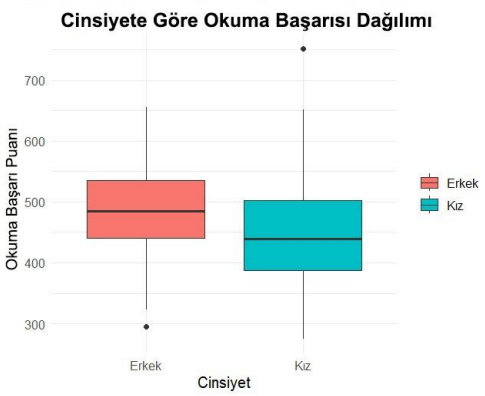

Figure 2 Reading Performance Distribution by Gender.

- **School Type (Vocational) → Negative effect (Beta = -35.86, p < 0.001)**

What it means: Students in vocational schools scored on average 35.86 points lower than students in general high schools. This may reflect curriculum differences, academic focus, or disparities in educational support.

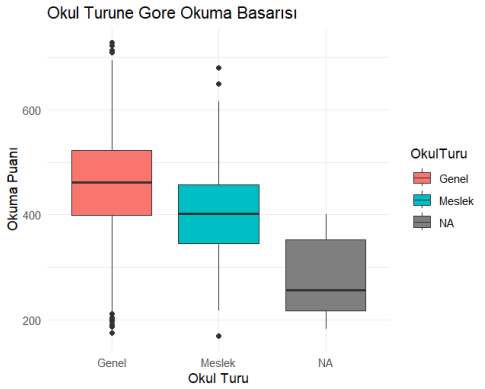

Figure 3 Reading Performance by School Type (General vs Vocational).

- **Gender (Female) → Negative effect (Beta = -23.84, p < 0.001)**

What it means**:** At first, the model showed that female students scored lower than male students. However, after including all 10 plausible values and applying student weights correctly, the results changed — showing that female students actually perform better in reading. This matches the official findings of the PISA 2022 Türkiye National Report (MoNE, 2024) and shows how important it is to apply the right weighting and imputation methods when working with large datasets like PISA.

- **Sense of Belonging (BELONG) → Positive effect (Beta = +7.30, p < 0.001)**

What it means: Students who feel a greater sense of belonging at school tend to perform better in reading. A positive school climate fosters motivation, engagement, and achievement.

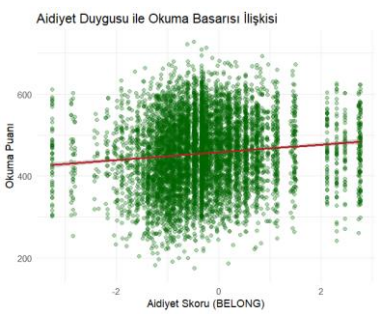

Figure 4 Scatter plot showing Sense of Belonging and Reading Performance.

-R-squared → 0.0828 (Model explains approx. 8.3% of variance)
What it means: The regression model accounts for 8.3% of the variation in reading scores. Although modest, this is considered acceptable in educational and social research, where multiple complex factors influence outcomes.

- Father's Education → Not significant (p > 0.05)
What it means: This variable did not show a statistically significant association with students' reading scores. While parental education is often linked to academic performance, in this model, father's education level did not emerge as a key predictor.

-Feel Safe at School (FEELSAFE) → Positive effect (Beta = +9.74, p < 0.001)
What it means:
Students who reported feeling safe at school tended to score higher in reading. A secure school environment may positively impact students' focus, engagement, and overall academic success.

-Mathematics Anxiety (ANXMAT) → Negative effect (Beta = -11.16, p < 0.001)
What it means:
Although the variable targets math anxiety, students with high anxiety levels performed worse in reading as well. This may reflect general academic stress or test-related anxiety affecting multiple domains.

-Lack of Help from Teachers (FEELLAH) → Negative effect (Beta = -5.47, p < 0.001)
What it means:
Students who felt that they could not get help from their teachers scored significantly lower in reading. Perceived teacher support appears to be an important factor in students' academic confidence and performance.

Residual Diagnostics

Residuals vs Fitted Plot: Supports linearity and constant variance
Histogram: Bell-shaped distribution
QQ Plot: Normality confirmed (minor tail deviations)

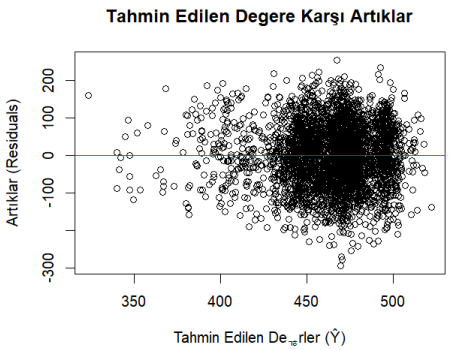

Figure 5 Residuals vs Fitted Values: Checking Linearity and Homoscedasticity.

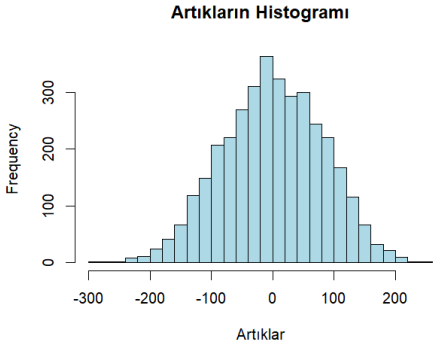

Figure 6 Histogram of Residuals: Distribution Approximates Normality

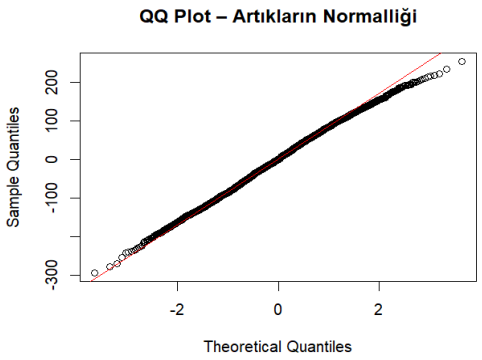

Figure 7 QQ Plot of Residuals: Slight Deviations at Tails

Conclusion: Model assumptions are largely met.

Conclusion & Discussion

This study shows that a student's reading performance is strongly linked to their mother's education level, how many books they have at home, their school type, gender, and how connected they feel to their school. Students with more books, a stronger sense of belonging, and more educated mothers tend to score higher in reading.

At first, female students seemed to perform worse. But after using all plausible values and applying student weights correctly, the results showed that girls actually perform better matching the official PISA 2022 Türkiye National Report.

Among emotional factors, sense of belonging, feeling safe at school, math anxiety, and teacher support all had meaningful effects. The strongest effect was found for the sense of belonging.

These findings show how important it is to use all plausible values and apply proper weighting methods when analyzing large-scale data like PISA. Doing so helps produce results that are accurate and consistent with national-level findings.

Educational Implications

Promote reading culture at home
Strengthening emotional support in schools
Provide targeted academic support in vocational schools
Invest in parental education and engagement programs

References

Ministry of National Education. (2024). *PISA 2022 Türkiye Ulusal Raporu*. https://pisa.meb.gov.tr/meb_iys_dosyalar/2024_03/21120745_26152640_pisa2022_rapor.pdf