



ALBUKHARY INTERNATIONAL UNIVERSITY

Project In Information Visualization

Title: Students' Academic Performance Analysis

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Date: 21/12/2025

Introduction :

In this project, the analysis of the academic performance of students with the help of the data visualization tool of Power BI is considered. Data set to be explored is the Students Performance, here we will explore pattern, distributions and relationships among student assessment scores and background characteristics. Through proper use of visualization techniques and design principles, the project will provide the insights in a clear and meaningful manner that can be used in making data-driven decisions in the education sector.

1) Dataset Description :

The dataset to be used on this project is the Students Performance Dataset. It includes academic performance history of students and demographics and background. These are gender, parental education status, type of lunch taken, preparation course of test, and the scores in three subjects, Math, Reading and Writing. This dataset is appropriate when conducting performance comparisons, score distributions, and relationships among academic subjects.

Columns:

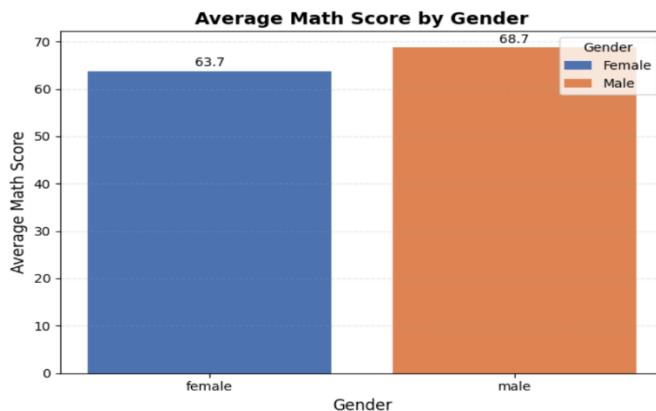
Each column represents a feature describing student background or academic performance.

- ❑ Student id
- ❑ Gender
- ❑ Race/ethnicity
- ❑ Parent education
- ❑ Lunch
- ❑ Test preparation course
- ❑ Math score
- ❑ Reading score
- ❑ Writing score
- ❑ Score

The dataset contains both categorical variables (such as gender, race/ethnicity, lunch type) and numerical variables (math, reading, and writing scores).

There are no complex hierarchical relationships, making the data easy to analyze using standard visualization techniques.

2) Visualization 1 + Analysis:

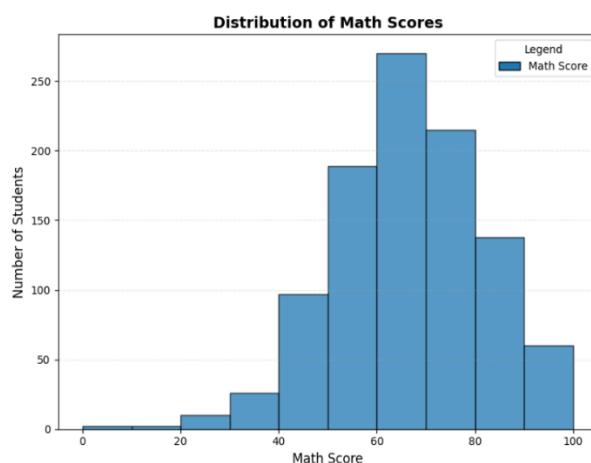


Visualization Type: Clustered Column Chart

Tool: Power BI

This chart compares the average math scores of male and female students. Each gender is represented using a distinct color and a legend for clarity. The comparison of average math scores based on gender was done using a clustered column chart since column charts are the most effective charts used in the comparison of values based on different categories. It is easy to detect the differences between the male students and female students, and the male average is 68.7 and for female is 63.7 so that mean male have the big averages score in math than female.

3) Visualization 2 + Analysis :



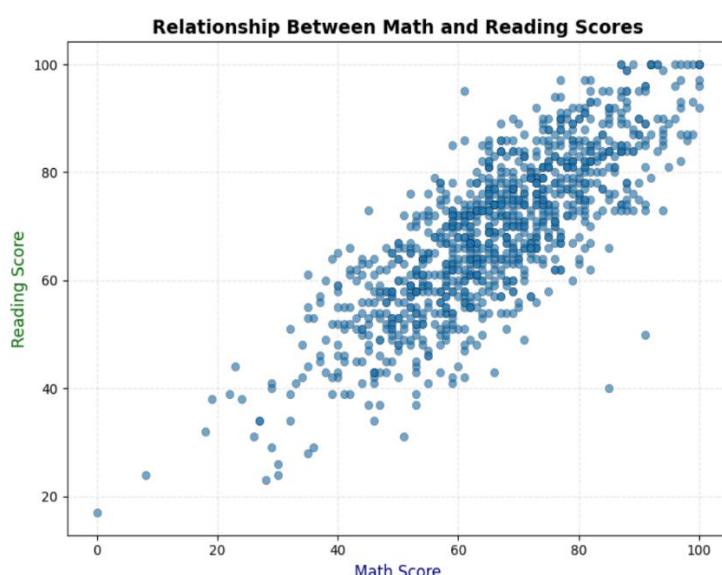
Visualization Type: Histogram

Tool: Power BI

The histogram shows the distribution of the math scores of all the students. The scores will be placed in bins that are the same size to display the number of students belonging to that range of scores.

A histogram was selected to represent the distribution of math scores, as it clearly shows how frequently different score ranges occur within the dataset. This makes it easier to understand overall performance trends and score concentration. This histogram shows that most students score between 50 and 80 in math. Very few students fall at the extreme low or high ends of the score range.

4) Visualization 3 + Analysis :



Visualization

Type:

Scatter

Plot

Tool: Power BI

This scatter plot visualizes the relationship between math and reading scores. Each point represents a student, allowing patterns and correlations between the two subjects to be observed.

This correlation implies that students with excellent performance in one subject would most likely be outstanding in another, which means that academic competencies are interrelated. This observation works since it demonstrates that the learning outcomes in the different subjects are interconnected. When the abilities in one area are advanced, it can have a beneficial impact on other disciplines.

5) Application of visualization design principles:

Clustered Column Chart (Mean Math Score by Gender):

The chart was used due to the fact that it is the best method of comparing the values between categories. It has vividly presented the disparity between male and female student average scores in math and thus making comparisons easier than line or area charts.

Histogram (Distribution of Math Scores):

Histogram was chosen to show the distribution of math scores in various ranges. A histogram unlike bar or pie charts, precisely reflects frequency and identifies typical and outliers ranges of scores.

Scatter Plot (Math Score vs Reading Score):

The analysis of the correlation between two numerical variables was selected as the scatter plot. It is also more appropriate than column or line charts to demonstrate correlations, and it is possible to see patterns and trends between math and reading scores without any complications.

6) Conclusion :

The project shows the potential of having a good data visualization used to analyze and convey insights regarding academic performance data of students. Using the visualizations that were properly designed, significant trends that included differences in performance and distribution of scores and correlation between subjects were discovered. Such understandings can inform teachers and policymakers to better their instructional practices, distribution of resources, and overall student achievement.