

STUDENT PERFORMANCE

ANALYTICS DASHBOARD

Intermediate Excel Data Analysis Project

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Software Used:

Microsoft Excel

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1. Synopsis:

The project analyzes a dataset of 1000 students to understand the factors influencing academic performance in Math, Reading, and Writing. Using Microsoft Excel, several calculated fields, PivotTables, Pivot Charts, KPIs, and slicers were created to explore how demographic, socioeconomic, and educational variables impact student outcomes.

The final output is an interactive dashboard that provides insights into test preparation effectiveness, parental education influence, gender differences, performance categories, and overall subject trends.

2. Project Objectives:

The primary objectives of this project are:

1. To analyze how demographic factors such as gender, race/ethnicity, and parental education influence student academic performance.
2. To evaluate whether completing a test preparation course improves average test scores.
3. To compare performance across core subjects-Math, Reading, and Writing.
4. To categorize students into performance groups and identify score distribution patterns.
5. To build an interactive Excel dashboard using PivotTables, Pivot Charts, KPIs, and slicers for dynamic data exploration.

3. Dataset Description:

The dataset used in this project contains 1000 students records and include variables related to demographics, academic performance, and school-related factors. The key fields in the dataset are:

- **Gender** – male or female
- **Race/Ethnicity** – group A, B, C, D, E
- **Parental Education Level** – high school, bachelor's degree, master's degree, etc.
- **Lunch Type** – standard or free/reduced
- **Test Preparation Course** – completed or none
- **Math Score** – numeric score (0-100)
- **Reading Score** – numeric score (0-100)
- **Writing Score** – numeric score (0-100)

Additional calculated fields were created during analysis:

- **Average Score.**
- **Pass/Fail Indicator.**

- **Performance Category:**

A new calculated column was added to classify students based on their Average Score. This categorization makes it easier to analyze overall performance patterns and identify groups that may require additional support. The four performance levels used in the project are:

- **Advanced** – Students with high overall performance and strong subject proficiency.
- **Intermediate** – Students performing above average but with some scope for improvement.
- **Basic** – Students showing average or slightly below-average performance.
- **Needs Help** – Students with low performance who may require additional academic assistance.

This classification supports deeper analysis in the dashboard, especially in identifying performance gaps across gender, parental education, and test preparation completion.

4. Methodology:

This project followed a structured data analysis workflow to ensure accuracy, clarity, and meaningful insights:

4.1 Data import and Cleaning:

- Loaded the “StudentsPerformance” dataset into Excel.
- Standardized column names and verified data types.

4.2 Feature Engineering:

- Average Score (mean of math, reading, and writing scores)
- Pass/Fail indicator based on a threshold of 70%
- Performance Category (Advanced, Intermediate, Basic, Needs Help)

4.3 Pivot Table Development:

- To analyze patterns, multiple PivotTables were created:
- Added individual fields to Rows, Values, and Filters.
- Designed Pivot Charts (bar, column, and pie charts) for each key performance factor.
- Applied consistent formatting across all charts for professional presentation.
- Removed unnecessary chart elements and customized color themes.

4.4 Dashboard Construction:

- Consolidated all PivotCharts into a single dashboard sheet.
- Inserted slicers (Gender, Lunch Type, Race/Ethnicity, Parental Education, Test Prep, Performance Category).
- Connected slicers to all charts for dynamic filtering and real-time data exploration.

5. Insights Summary (Chart-by-Chart):

5.1 Average Score by Test Preparation Course:

- Students who completed test preparation scored significantly higher.
- Indicates strong effectiveness of prep programs.

5.2 Average Score by Parental Education Level:

- Higher parental education (Bachelor's & Master's degree) correlates with higher student performance.

5.3 Pass Count by Gender:

- Female students have a slightly higher pass count.
- Points to marginal gender-based performance variation.

5.4 Average Score by Race/Ethnicity:

- Group E and Group D show comparatively higher average scores.
- Highlights performance gaps across ethnic groups.

5.5 Count by Lunch Type:

- Students with standard lunch outperform those with free/reduced lunch.
- Suggests socioeconomic factors influence academic outcomes.

5.6 Subject Score Comparison:

- Math typically shows the highest variability among students.
- Reading and Writing trends remain closely aligned.

5.7 Average Subject Scores by Gender:

- Females slightly outperform males in Reading and Writing.
- Math scores remain relatively balanced.

5.8 Pass Count by Parental Education:

- Higher parental education corresponds to more passes.
- Supports socio-educational influence patterns.

5.9 Performance Category Distribution:

- Majority of students fall under Intermediate and Basic.
- A smaller percentage requires academic support.

5.10 Overall Score Distribution (KPIs):

- Average Score: 67.77
- Highest Score: 300 ➤ Pass Percentage: 71.5%

6. Formula Logic & Explanation:

★ During the analysis, several calculated fields and logical formulas were created to prepare, categorize, and interpret the student performance data. Each formula played a specific role in producing insights for the dashboard.

6.1 Average Score Formula

Formula Used:

$$= (\text{Math Score} + \text{Reading Score} + \text{Writing Score}) / 3$$

Purpose:

- To compute a student's overall academic performance across all three subjects.

Result & Interpretation:

- This formula produced the Average Score column, which became the foundation for further analysis such as:

1. Performance categorization
2. Pass/Fail classification
3. Visual comparisons of student groups

➤ The overall dataset average was 67.77, showing moderate performance across the sample.

6.2 Pass/Fail Indicator Formula

Formula Used:

$$=\text{IF}([\text{@AverageScore}] \geq 70, \text{"Pass"}, \text{"Fail"})$$

Purpose:

- To categorize students into Pass or Fail groups based on a performance threshold.

Result & Interpretation:

1. Students scoring 70 or above were labeled Pass.
2. All others were labeled Fail.

This enabled analysis of:

1. Pass count by gender
2. Pass patterns across parental education
3. How socioeconomic factors affect passing rates

➤ The final pass percentage was 71.5%, showing a majority of students met expectations.

6.3 Performance Category Formula

Formula Used:

```
=IF([@AverageScore] >= 85, "Advanced",  
IF([@AverageScore] >= 70, "Intermediate",  
IF([@AverageScore] >= 50, "Basic", "Needs Help")))
```

Purpose:

- To classify students into detailed performance segments for deeper insight.

Result & Interpretation:

- The formula assigned students to one of four groups:

Category	Meaning
• Advanced	• High-performing students with strong academic capability.
• Intermediate	• Above-average students with minor improvement areas.
• Basic	• Average or slightly below-average performers.
• Needs Help	• Low performing students requiring academic intervention.

- This classification helped identify performance patterns across:

- Gender
- Ethnicity
- Parental education
- Lunch type
- Test preparation completion

6.4 Total Score Formula

Formula Used:

```
=[@MathScore] + [@ReadingScore] + [@WritingScore]
```

Purpose:

- To calculate cumulative performance across all subjects.

Result & Interpretation:

- Helped validate scoring ranges and ensured accurate pivot table grouping.
- The maximum total score observed was 300, used as a high-performance KPI.

6.5 KPI Calculations (Dashboard Summary Metrics)

A. Highest Score

=MAX(StudentsTable[TotalScore])

Result:

- Highest score recorded: 300

B. Average Score

=AVERAGE(StudentsTable[AverageScore])

Result:

- Overall average: 67.77

C. Pass Percentage

=COUNTIF(StudentsTable[Pass_Fail], "Pass") / COUNTA(StudentsTable[Pass_Fail])

Result:

- Pass rate: 71.5%

D. Total Students

=COUNTA(StudentsTable[StudentID])

Result:

- Total dataset size: 1000 students

7. Challenges Faced & Solutions Implemented:

During the development of the Student Performance Analytics Dashboard, several technical and analytical challenges were encountered. The following points summarize the key challenges and how they were effectively resolved:

7.1 Creating Meaningful Performance Categories

Issue:

- The dataset did not include predefined performance levels (Advanced, Intermediate, Basic, Needs Help), making it difficult to analyze performance beyond raw scores.

Solution:

- A custom IF formula was designed to classify students based on their Average Score.
- This allowed deeper insight into academic distribution and made the dashboard more actionable.

7.2 Ensuring All Charts Update Dynamically

Issue:

- Multiple pivot charts were created on separate worksheets, and slicers were initially connected to only one chart at a time.

Solution:

- Manually used Report Connections (PivotTable Connections) to link all pivot tables to all slicers.
- This allowed the dashboard to become fully interactive and unified—changing one slicer now updates every chart.

7.3 Managing Dashboard Layout and Chart Readability

Issue:

- With 10 charts on a single dashboard, spacing, sizing, and visual clarity became difficult.

Solution:

- Charts were resized uniformly and aligned using Excel's alignment tools. Unnecessary chart elements such as gridlines and legends were also removed to improve readability and design.

7.4 Handling Bulky Dataset

Issue:

- The dataset contained 1000 rows with multiple categorical fields, making it time-consuming to extract trends manually.

Solution:

- Used PivotTables, data grouping, and calculated fields to reduce manual work and ensure accuracy.

8. Final Conclusion:

The Student Performance Analytics Dashboard successfully provides a comprehensive and interactive view of how various demographic, socioeconomic, and educational factors impact student academic outcomes. By leveraging Excel formulas, PivotTables, PivotCharts, and slicers, the project transforms raw data into meaningful insights that highlight performance trends and areas requiring intervention.

The dashboard reveals clear patterns such as:

- Students who complete test preparation perform significantly better.
- Parental education strongly correlates with higher average scores.
- Lunch type (standard vs. free/reduced) reflects socioeconomic influence on performance.
- Female students show higher performance in reading and writing, while math scores remain competitive between genders.
- Performance categories indicate that a noticeable portion of the student population needs additional academic support.
- Overall, the dashboard serves as a practical analytical tool for identifying strengths, weaknesses, and opportunities for educational improvement.

9. Recommendations:

Based on the insights derived from the analysis, the following recommendations are proposed:

9.1 Strengthen Test Preparation Programs

- Since test prep completion significantly boosts scores, expanding such programs could improve overall performance metrics.

9.2 Provide Additional Resources for Students with Socioeconomic Challenges

Students with free/reduced lunch tend to score lower. Schools should consider:

- Extra tutoring.
- Mentorship programs.
- Learning support resources.

9.3 Targeted Support for “Needs Help” and “Basic” Students

These groups should receive personalized academic support, including:

- Remedial classes.
- Learning workshops.
- Progress tracking through frequent assessments.

9.4 Engage Parents in the Educational Process

- Higher parental education correlates with higher student performance.

Schools may introduce:

- Parent workshops.
- Academic awareness programs.
- Home-study guidance sessions.

9.5 Introduce Subject-Specific Interventions

- Different gender groups excel in different subjects. Tailored interventions can improve balance between math, reading, and writing outcomes.

9.6 Maintain and Expand Data-Driven Decision Making

The dashboard should be updated regularly to:

- Track progress
- Evaluate interventions
- Identify new trends