

Case Study: Student Performance Factors and Exam Outcomes

I. Executive Summary

- **Objective:** Identify behavioral and support factors that influence student exam performance using interactive Excel analysis.
- **Key Findings:**
 - Students studying **20+ hours** consistently scored in the **80–89 range**, with diminishing returns beyond 30 hours.
 - **High motivation** and **access to resources** boosted scores even among students with fewer study hours.
 - **Sleep deprivation** (≤ 4 hours) negatively impacted scores regardless of study time.
- **Recommendations:**
 - Encourage structured study plans targeting the 20–30 hour range.
 - Prioritize resource access and motivation-building programs.
 - Promote sleep hygiene initiatives for academic success.
- **Impact:** Insights can inform academic support strategies, potentially improving average exam scores by 10–15%.

II. Introduction and Business Problem

- **Context:** Academic performance analysis using a simulated dataset of student behaviors and support factors.
- **Problem:** Educators lack visibility into how study habits and support variables interact to affect exam outcomes.
- **Goals & Questions:**
 - What is the optimal number of study hours for high exam scores?
 - How do sleep, motivation, tutoring, and resource access influence performance?
- **Success Metrics:**
- Identification of actionable performance drivers.
- Clear visualizations and quantified insights for academic strategy planning.

III. Data Understanding and Preparation

- **Dataset Overview:**
 - ~100 student records with variables: Hours_Studied, Sleep_Hours, Access_to_Resources, Tutoring_Sessions, Motivation_Level, Exam_Score, Score_Class.
- **Data Cleaning:**
 - Removed nulls and standardized categorical values (e.g., High/Medium/Low).
 - Bucketed Exam_Score into Score_Class ranges: <60, 60–69, 70–79, 80–89, 90+.
- **Feature Engineering:**
 - Created average score metrics by study hour.
 - Mapped score distributions across behavioral filters.

- **Tools Used:**
- Excel (PivotTables, slicers, bar charts, conditional formatting).
- Power Query (null handling, categorical mapping).

IV. Analytical Methodology and Findings

A. Descriptive Statistics & Baseline

- **Mean Exam Score:** ~72
- **Score Class Distribution:** Majority clustered in 70–89 range
- **Key Visuals:** Pivot table showing average score and score class by Hours_Studied

B. Segmentation Analysis

- **Study Hours vs. Score Class:**
 - 20–30 hours = peak performance (80–89 range)
 - 30 hours = diminishing returns
- **Sleep Hours:**
 - ≤ 4 hours = consistent drop in scores
- **Motivation Level:**
 - High motivation = higher scores even with fewer study hours
- **Tutoring Sessions:**
 - Most effective for students in 60–69 range
- **Key Visuals:**
- Bar chart with color-coded score classes
- Slicers for interactive filtering by behavioral factors

V. Conclusions and Recommendations

- **Summary of Key Insights:**
 - Study time, motivation, and sleep are critical performance drivers.
 - Tutoring is most impactful for borderline performers.
- **Actionable Recommendations:**
 - Implement study plans targeting 20–30 hours/week.
 - Launch motivation-building and resource access programs.
 - Integrate sleep education into academic wellness initiatives.
- **Business Impact:**
- Potential to improve average scores by 10–15%
- Better targeting of academic support resources