

# Student Performance and Risk Analytics

Excel-based Dashboard | Feature Engineering

## Project Objective:

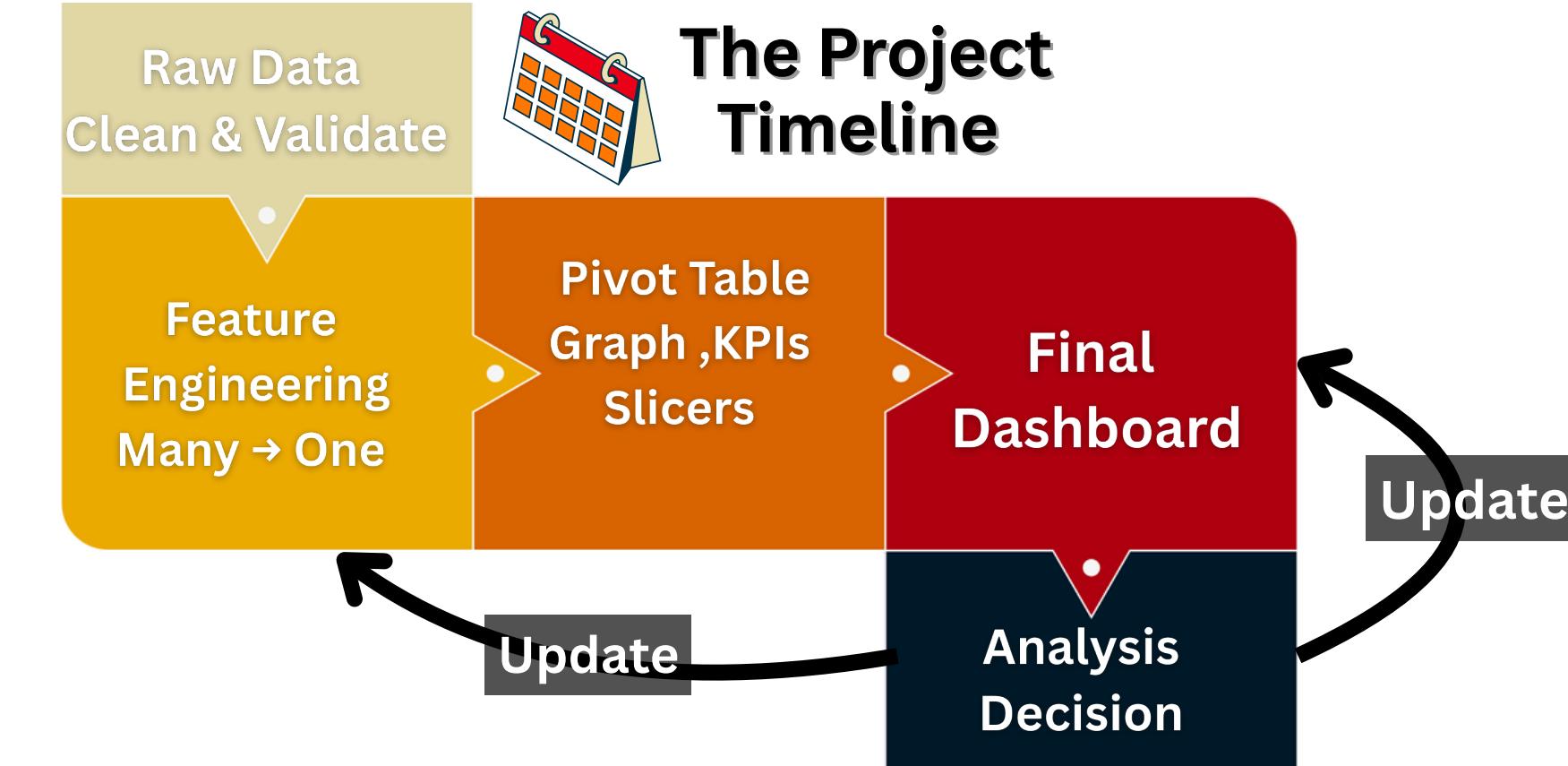
- Analyzed student behavior, academic history, and social factors to uncover what impacts **performance** and identify students at risk.

## Dataset Used:

- [UCI Machine Learning Repository](#) – Student Performance (math) Data .
- 395 records, 33 raw features**
- Fields:** academic grades (G1, G2, G3), parent education, studytime, absences, internet etc.

## Tools & Techniques:

- Excel Tables, PivotTables, Charts, Slicers
- Conditional formatting**, feature engineering
- Slicer-linked KPIs**, charts and Pivot Tables
- Dashboard layout:**
  - KPI row + interactive filters + insights charts



## Step-by-Step Workflow:

- Raw Data Cleaning (**find-replace, standardize ,Yes/No, converting**)
- Feature Engineering (**Avg. Grade, Trend, Risk, Engagement, Social , Labels, Values, Risk Level**)
- PivotTable Modeling (KPI and visual insights)
- Dashboard Design (**user-friendly, dynamic, slicer-based**)
- Recommendations based on performance patterns

# Data Preparation & Feature Engineering

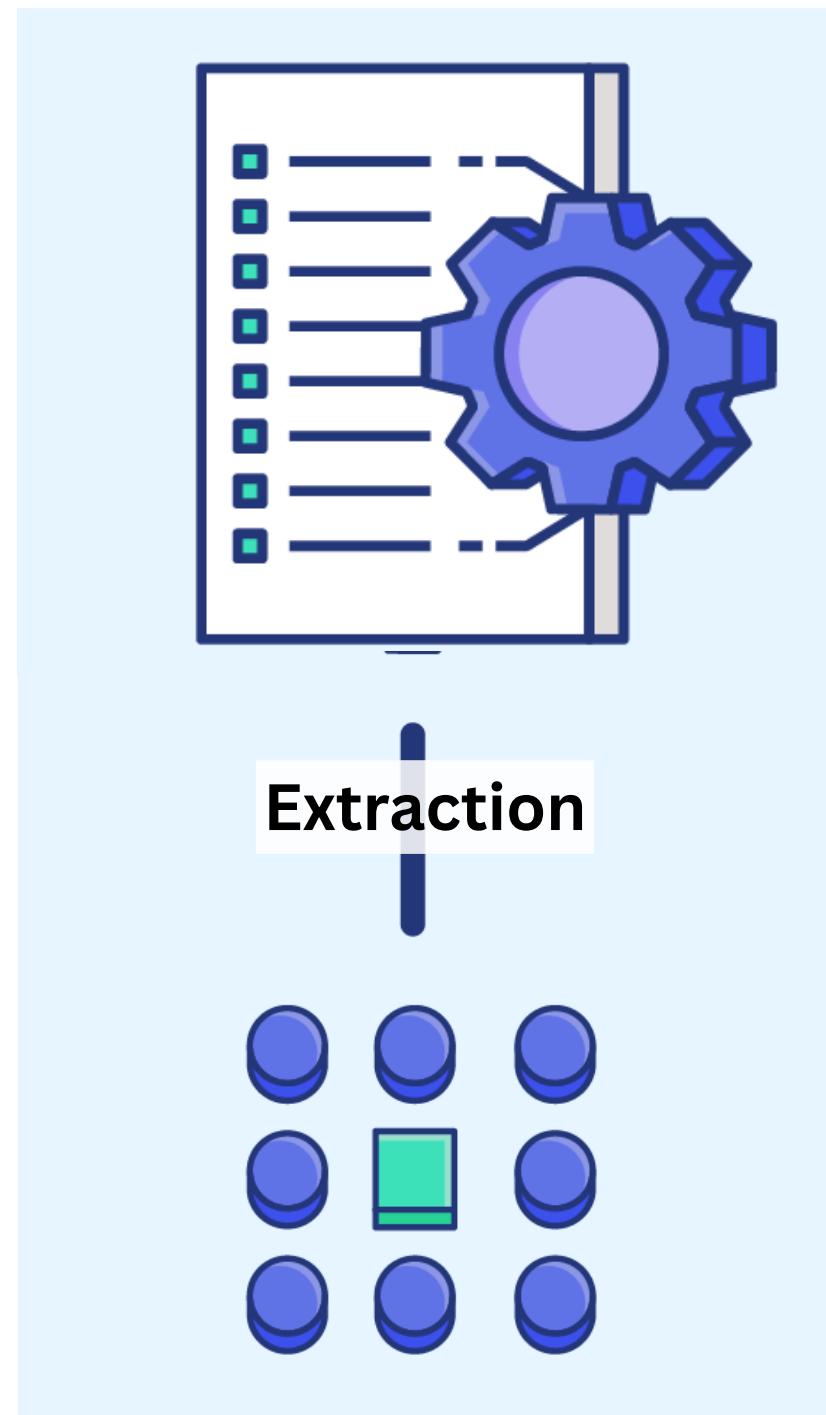
Raw columns → Engineered, business-ready insights

## Cleaning Steps:

- Transformed all Yes/No, M/F, and U/R fields into **binary formats (0/1 or category labels)**
- Converted `famsize` and `address` into **categories (Small/Medium/Large, Rural/Urban)**
- Confirmed appropriate column types: **numeric vs. categorical** ; checked for any **outliers**
- Validated the dataset:** by no null values or duplicate rows, and **removed unnecessary Columns**

Feature Name	Description / Logic
Average_Grade	<b>AVERAGE(G1, G2, G3)</b> — final academic performance
Delta12 / Delta23	Change between exam terms ( <b>G2-G1, G3-G2</b> )
Performance_Trend	<b>Declining / Improving / Mixed</b> – based on $\Delta 12$ and $\Delta 23$
Performance_Label	<b>Excellent / Good / Average / Fail</b> (based on thresholds on Average_Grade)
Parental_Edu	<b>Medu + Fedu</b> – total education score by parents support
Parent_Edu_Level	<b>Low / Medium / High</b> (based on Parental_Edu bins)
Risk_Score	<b>Composite score</b> using failures, absences, support flags
Risk_Level	<b>High / Medium / Low</b> (based on Risk Score)
EngagementScore	Sum of: schoolsup + paid + activities + higher ( <b>0-5 scale</b> )
SocialScore	romantic + freetime + goout ( <b>0-15 scale</b> )
Engagement_Level	Binned: <b>High / Medium / Low</b>
Social_Level	Binned: <b>High / Medium / Low</b>

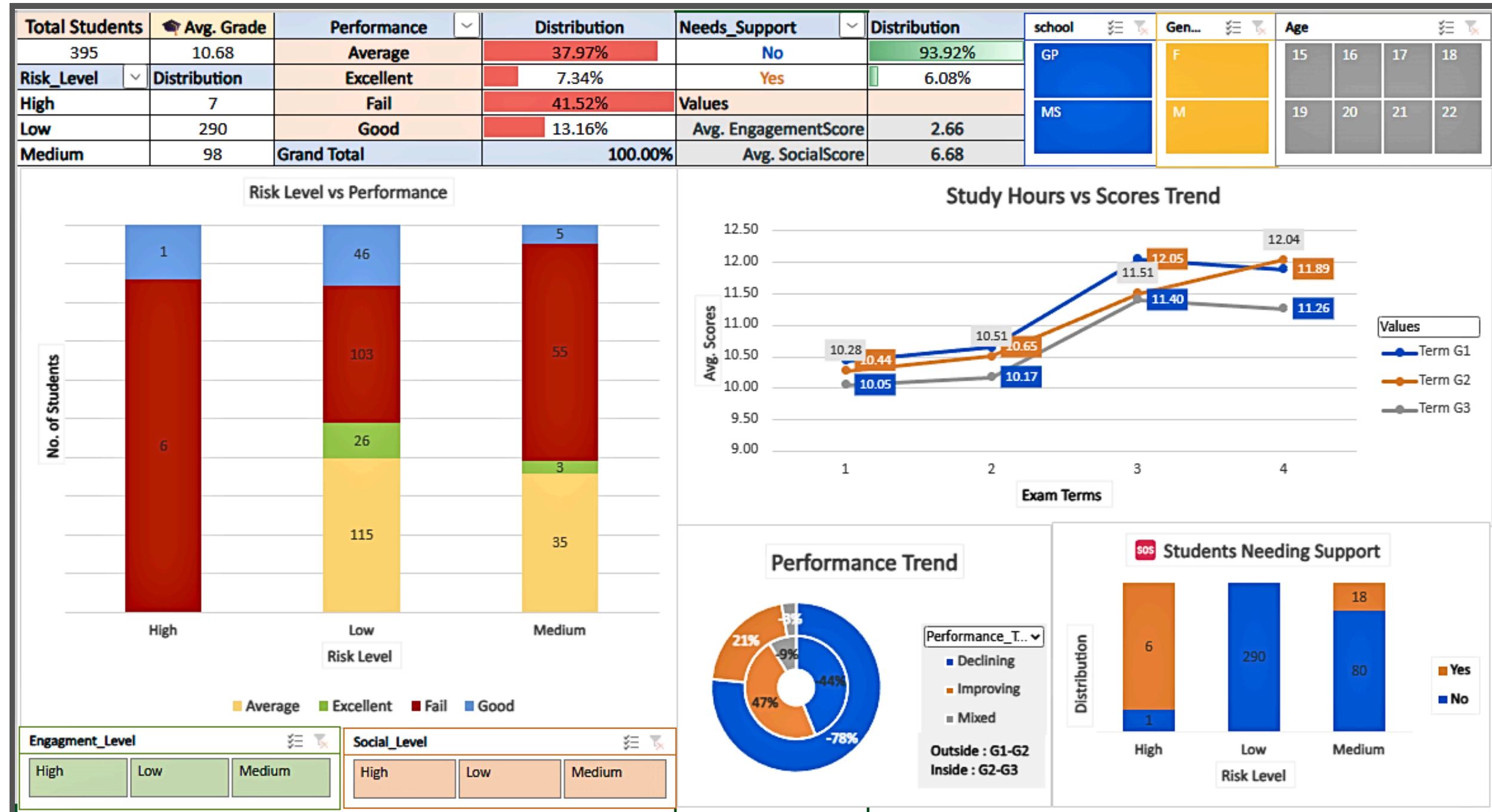
395 records × 40 columns  
Cleaning + Feature engineering



# Dashboard Contents & Key Insights

Visualizing Academic, Behavioral & Risk Patterns

- ⌚ **Relevance:** Focused on the most actionable student attributes (**performance, behavior, risk, support**)
- ⚡ **Speed:** KPIs and slicers let users instantly filter and discover patterns (e.g., by **gender, age, school**)
- 🔄 **Interactivity:** **PivotTables, Slicers, and dynamic charts** respond in real-time for what-if analysis



Q Built just to “look good.” but to: ×

- Identify at-risk students
- Evaluate school or learning program effectiveness
- Help educators focus their attention where it's needed most

## KEY INSIGHTS

- ✓ **1. 86% of High-Risk students failed**
  - Clear indicator that the Risk Score & Level are highly predictive. These 7 students can be flagged for urgent academic support.
- ✓ **2. Studytime ≥ 3 hrs/week = +2.1 grade improvement**
  - Line chart shows direct academic gain with more studytime — supporting structured study group initiatives.
- ✓ **3. Internet access lifts average grade by +2.1 points**
  - Students with connectivity perform significantly better. School-wide access programs could reduce the learning gap.
- ✓ **4. Only 6.08% students truly need support**
  - Targeted intervention becomes feasible — enabling efficient use of faculty or resources for a small, high-risk group.
- ✓ **5. 47% of students show “Improving” performance**
  - This suggests that learning programs (between G1–G3) are already helping many students — evidence-based success.

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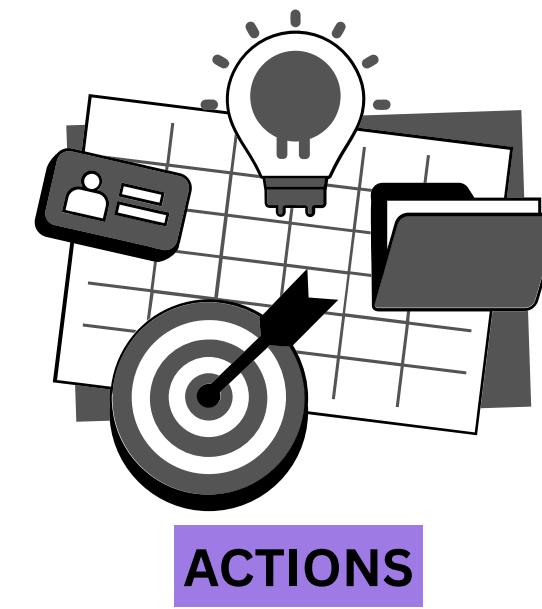
“Higher engagement and low social scores can improve grades, indicating that non-academic behavior data aids in personalizing support.”

# From Insight to Business Action

## Turning student data into smarter interventions



Metric	Value	Suggested Action
High-Risk Students	7	<i>Prioritize for 1-on-1 support</i>
Internet Gap (Score ↑)	2.1	<i>Launch school-wide internet plan</i>
Studytime Gain (Score ↑)	2.1	<i>Recommend structured study programs</i>
Needs_Support %	6.08%	<i>Hyper-target small group interventions</i>
Improving Students	47%	<i>Prove school strategies are working</i>



## Strategic Recommendations

### 1. Target High-Risk Students for Intervention

Only 7 students are flagged High-Risk – 6 of them failed. ➔ Enable early academic counseling & 1-on-1 mentoring for this small, critical group.

### 2. Expand Internet Access to Close the Digital Gap

Students with internet access scored +2.1 points higher. ➔ Launch subsidized Wi-Fi or device support for offline students.

### 3. Encourage Studytime ≥ 3 hours/week

Clear correlation: more studytime → better grades across all terms. ➔ Create study circles, after-school prep hours, or peer tutoring clubs.

### 4. Empower Families with Low Parental Education

Students from lower Parental\_Edu\_Level underperformed average ➔ Recommend organizing parent outreach sessions & engagement programs.

### 5. Use Engagement & Social Score Metrics to Personalize Support

These help identify students needing help even before grades drop. ➔ Integrate into early warning systems and student profiles.