Hilmi's Team :

Hary Ramadhana Nasution

Rizka Rasyida

Muhammad Azzahrul Ramadhan

M. Fawwaz Akbar

Salma Nuramalia

DATA ANALYSIS REPORT: STUDENT PERFORMANCE AND APTITUDE

The Key English Course – Academic Excellence Study

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1. Data Preview & Quality Assurance

1.1 Dataset Overview

The analysis is based on two primary datasets: Student Aptitude and Student Performance.

- **Student Aptitude**: 3 columns, 150 rows. (No null or duplicate data).
- **Student Performance**: 3 columns, 150 rows. (No null or duplicate data).

1.2 Overall Descriptive Statistics

Statistic	student_id	aptitude_score	performance_score
Count	150	150	150
Mean	75.50	44.24	2.54
Std Dev	43.45	24.23	0.65
Min	1	9	1.55
50% (Median)	75.50	38	2.48
Max	150	97	3.80

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2. Performance Analysis by Course Level

2.1 Comparative Performance

Table 2: Performance Scores Across Levels

Course Level	Students	Mean Score	Typical Range (SD)
Advanced	50	3.24	2.85 – 3.62
Intermediate	50	2.52	2.13 – 2.91
Foundation	50	1.86	1.69 – 2.03

2.2 Statistical Validation (One-Way ANOVA)

- **F-Statistic:** 213.43
- **p-value:** < 0.001 (Highly Significant)
- **Effect Size (Cohen's d):** 4.59 (Advanced vs. Foundation)

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3. Aptitude Analysis across Course Levels

3.1 Aptitude Distribution

Students in the **Advanced** level have nearly triple the average aptitude score of those in the **Foundation** level.

Table 3: Aptitude Scores Across Levels

| Course Level | Mean Aptitude | Minimum | Maximum |

| :--- | :---: | :---: | :---: |

| **Advanced** | 67.46 | 45 | 97 |

| **Intermediate** | 42.74 | 28 | 65 |

| **Foundation** | 22.52 | 9 | 40 |

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4. The Relationship Between Aptitude and Performance

4.1 Correlation Analysis

We conducted a correlation test to see if a student's aptitude score can accurately predict their final performance.

Test Type	Correlation Coefficient (r)	Interpretation
Pearson Correlation	**0.887**	Very Strong Positive
Spearman Rank	**0.863**	Very Strong Positive

Shared Variance: 78.7% (0.887^2). This means that nearly 79% of the variation in a student's performance is explained by their aptitude score.

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5. Statistical Robustness & Methodology

While our data showed some non-normality (Shapiro-Wilk) and unequal variance (Levene's test), the **One-Way ANOVA** remains a valid and robust choice because:

1. **Balanced Design**: Every group has an equal N of 50. ANOVA is robust to variance differences when sample sizes are equal.
2. **Central Limit Theorem**: With $N=50$ per group, the sampling distribution of the mean is approximately normal.
3. **Cross-Validation**: Non-parametric **Kruskal-Wallis** tests yielded identical results ($p = 0.0000$).

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6. Strategic Implications for Placement

- **Placement Accuracy**: The massive **Cohen's d of 4.59** for performance suggests that the placement criteria successfully separate students into distinct competency brackets.
- **Predictive Validity**: Because of the high correlation ($r = 0.887$), the initial aptitude test is a valid tool for forecasting student success.
- **Program Quality**: There is no "gray area" between levels. The Advanced, Intermediate, and Foundation groups represent three distinct stages of learner development.

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7. What These Numbers Mean for Daily Operations

7.1 Instruction Strategies for Teachers

- **Advanced Level (Creative Autonomy):** With high aptitude and higher variance (SD 0.38), these students are ready for complex, less-structured projects.
- **Intermediate Level (Scaffolding):** These students are in the "sweet spot" for progress. Focus on pushing them toward Advanced materials with clear milestones.
- **Foundation Level (High Structure):** Very low variance (SD 0.17) means students are at similar levels. Highly structured, repetitive drilling of fundamentals works best here.

7.2 For Management & Marketing

- **Intake Efficiency:** You can confidently tell prospective parents that your placement test is **79% accurate** in predicting where their child will be at the end of the term. This builds massive trust.
- **Resource Allocation:** Allocate "flexible/creative" teachers to Advanced levels and "methodical/structured" teachers to Foundation levels to match the data-driven needs of those groups.

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8. Conclusion & Final Recommendation

The analysis confirms that "The Key English Course" operates a highly effective leveling system. The strong link between aptitude and performance validates the current testing protocols.

Final Recommendation: Maintain the current 3-tier structure, but consider introducing "Advanced-Electives" for the high-variance Advanced group to cater to their diverse learning needs.

Report Prepared by: Hary Ramadhana Nasution

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