Student Performance and Aptitude Analysis

A Comprehensive Data-Driven Study

Understanding Student Success Across Course Level

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I.   Client Background

The Key Kampung Inggris is an English education provider committed to delivering inclusive, high-quality learning, and equal access. With this commitment, accurate course placement is essensial to ensure students are assigned to learning environments that match their abilities and support equitable outcomes.

This project presents a statistical analysis of 150 students across three English course levels (Foundation, Intermediate, and Advanced) to validate the effectiveness of The Key's course placement system. The analysis examines the relationship between aptitude test scores and actual student performance to ensure students are placed in appropriate learning environments. The results aim to provide data-driven insights to support fair, effective, and sustainable placement decisions.

II.   Northstar Metrics

- Do students with different performance levels enroll in different course levels?
- Are there significant differences in aptitude scores across course levels?
- What is the correlation between aptitude scores and performance?
- What are the implications for course placement and program quality?

III.   Data Overview

3.1. Overall Descriptive Statistics

Before looking at differences between levels, data were verified. The data contains no missing values and each course level includes an equal number of students.

Let's see the overall picture:

Table 1. Overall Descriptive Statistics

Measure	Performance Score	Aptitude Score
Count	150	150
Mean	254	44,24
Median	247,5	38
Min	155	9
Max	380	97
Range	225	88

3.2. Descriptive Statistics by Course Level

- **Performance Score**

Now lets see how each level differs:

Table 2. Performance Score Across Course Levels

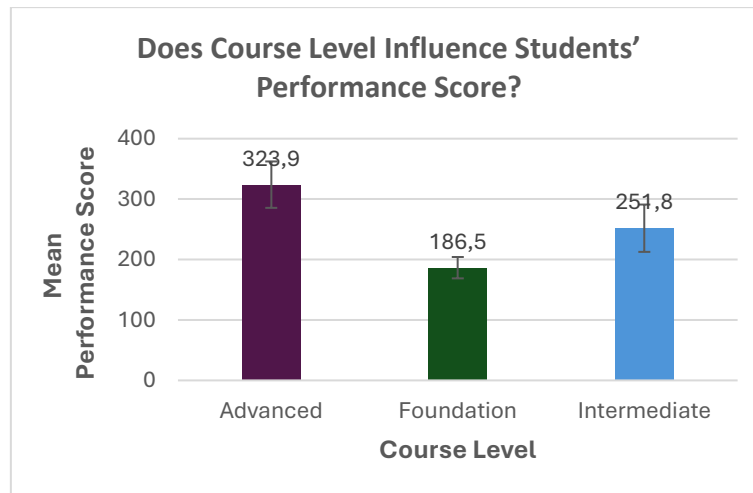| Course Level	Students	Mean	Max	Min	SD
Advanced	50	323,9	380	250	38,40
Intermediate	50	251,8	355	190	39,14
Foundation	50	186,5	245	155	17,68

Figure 1. Average Performance Scores Across Course Levels (SD)

Interpretation. Across course levels, the average scores increase from Foundation to Intermediate to Advanced. This clear staircase pattern is exactly what we expect in a placement system. While average scores clearly increase across levels, variability is higher in Intermediate and Advanced levels. This means students in these levels have more diverse abilities, even though they are correctly placed overall.

- **Aptitude Score**

    Now lets see how each level differs:

Table 3. Aptitude Score Across Course Levels

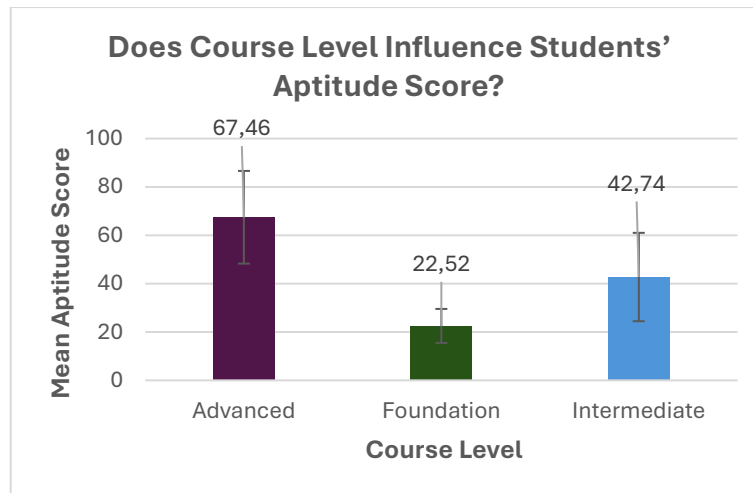| Course Level	Students	Mean	Max	Min	SD
Advanced	50	67,46	97	30	19,17
Intermediate	50	42,74	90	14	18,28
Foundation	50	22,52	41	9	7,03

Figure 2. Average Aptitude Scores Across Course Levels (SD)

Interpretation. the average performance clearly increases across levels, which we observe consistently. Higher levels show greater variability, indicating more diverse learner profiles among Intermediate and Advanced students. The clear differences in average scores confirm that overall placement remains appropriate.

IV.   Result

4.1 Do students with different performance levels enroll in different course levels?

A one way ANOVA was performed to examine differences in performance scores across three course levels. The results show a highly significant difference ($p < 0.001$), meaning that students in different course levels perform differently on average and these differences are unlikely to have occured by chance. Post-Hoc Tests (Bonferroni Correction) show that all pairwise comparisons were significantly different between Advanced, Intermediate, and Foundation. This confirms that each level represents a distinct performance group.

Table 4. Post-Hoc Tests Performance Score

Course Level	P value	Significant
Advanced VS Intermediate	P < 0,001	Significant
Intermediate VS Foundation	P < 0,001	Significant
Foundation VS Advanced	P < 0,001	Significant

4.2 Are there significant differences in aptitude scores across course levels?

Interpretation. A one way ANOVA was revealed significant difference across course levels ($p < 0.001$), meaning that students in different course levels perform differently on average and is unlikely to have occured by chance. This confirms that course level is strongly associated with student aptitude.

Post-Hoc Tests (Bonferroni Correction) revealed that students in different course levels have clearly different aptitude profiles on average. This confirms that the aptitude based placement system is applied consistently and produces well separated groups.

Table 5. Post-Hoc Tests Aptitude Score

Course Level	P value	Significant
Advanced VS Intermediate	P < 0,001	Significant
Intermediate VS Foundation	P < 0,001	Significant
Foundation VS Advanced	P < 0,001	Significant

4.3 What is the correlation between aptitude scores and performance?

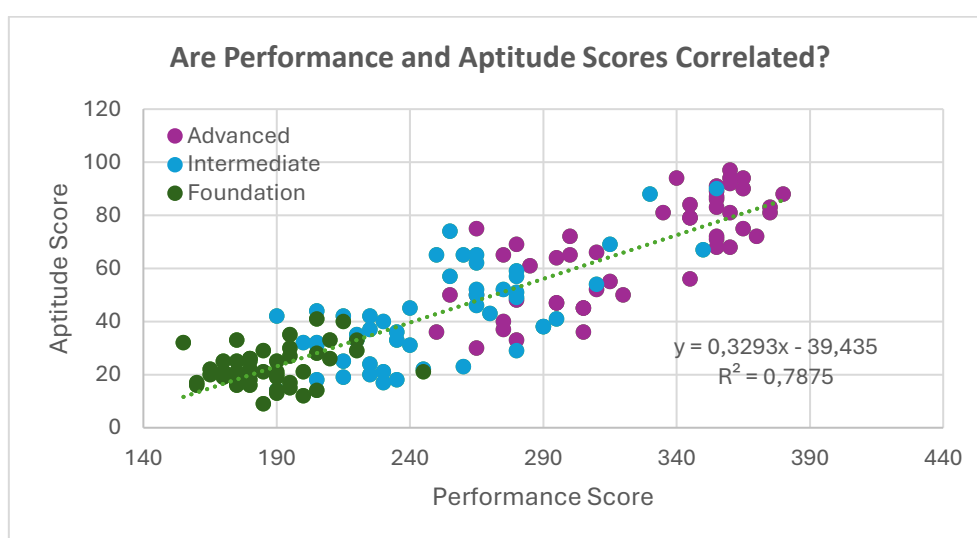Now lets see how performance score and aptitude score correlated:

Figure 3. Correlation Between Aptitude Scores and Performance Scores by Course Level

Table 6. Correlation by Course Level

Course Level	r	Interpretation
Advanced	0,777	Strong
Intermediate	0,704	Strong
Foundation	0,299	Weak

Interpretation. Overall, there is a strong positive correlation between aptitude and performance score ($R^2 = 0,7875$, r = 0,887), indicating that higher aptitude scores are associated with higher performance, indicating that placement system aligns well with learning outcomes and that students are generally placed in environments appropriate to their ability level

The correlation between aptitude scores and performance scores is strong at the Advanced and Intermediate levels but weaker at the Foundation level. However,

the relationship remains positive and statistically significant, although not as strong as at the higher levels. This suggests that early stage learners may still be adapting and factors such as motivation and teaching support play a larger role than aptitude alone.

4.4 What are the implications for course placement and program quality?

Aptitude scores can be effectively used for course placement, as they show a strong correlation with performance scores. The significant differences across levels indicate that the curriculum is well structure and appropriately differentiated. However, the weak correlation observed at the Foundation level doesn't undermine the overall finding.

Course Placement

- Aptitude test is a valid and effective placement tool

- Students are placed into clearly distinct levels

Program Quality

- Clear performance gaps indicate structured curriculum works

- Foundation level may benefit from extra mentoring to strengthen the aptitude performance link