Predicted vs Actual PANCE Scores for 2025, 2024, 2023

September 15, 2025

We have a robust tracking system that predicts the outcome on the PANCE exam, based on test scores like PACKRAT, EORs and other criteria. This analysis is a little more information than just the 5-year Pass rate on PANCE. We are including this as a way to help inform our stakeholders of how we are doing as a PA Program in preparing our students with medical knowledge as they enter the field of medicine. Below, Predicted, and actual scores are reported in aggregate and then again for individual graduates. We illustrate the numbers of students that overperformed the model and those that underperformed. We feel that variations within a year and from year to year says something about the model and possibly non-academic factors.

From a historical perspective, the class of 2023 and the class of 2024 were both impacted by COVID pandemic. This class of 2025 is the first class to come through the program without the program having to adapt to pandemic circumstances.

Predicted Scores for CO 2025 (n=16, so far)

- **Mean: 455.4**
- **Range: 361 – 544**
- **Standard Deviation: 50.3**

Actual Scores

- **Mean: 471.3**
- **Range: 380 – 580**
- **Standard Deviation: 58.6**

Over/Under (difference between actual and predicted)

- **Mean: +15.9 points**
- **Range: –44 to +83**
- **Standard Deviation: 35.5**

Correlation (Predicted vs Actual)

Correlation coefficient (r): 0.80

Interpretation: This indicates a strong positive correlation between predicted and actual scores. Predictions aligned fairly well, but with meaningful individual variation.

Counts – as of this writing all students have passed

- **10 students scored above their predicted score.**
- **6 students scored below predicted.**
- **0 students matched exactly.**

Analysis

The updated Towson University PA graduate data continues to show that the predictive model aligns closely with actual PANCE performance, with a strong correlation (r = 0.80).

The actual mean score (471) is about 16 points higher than the predicted mean (455.4), showing that on average, students are slightly outperforming expectations, though the margin is smaller than in earlier results.

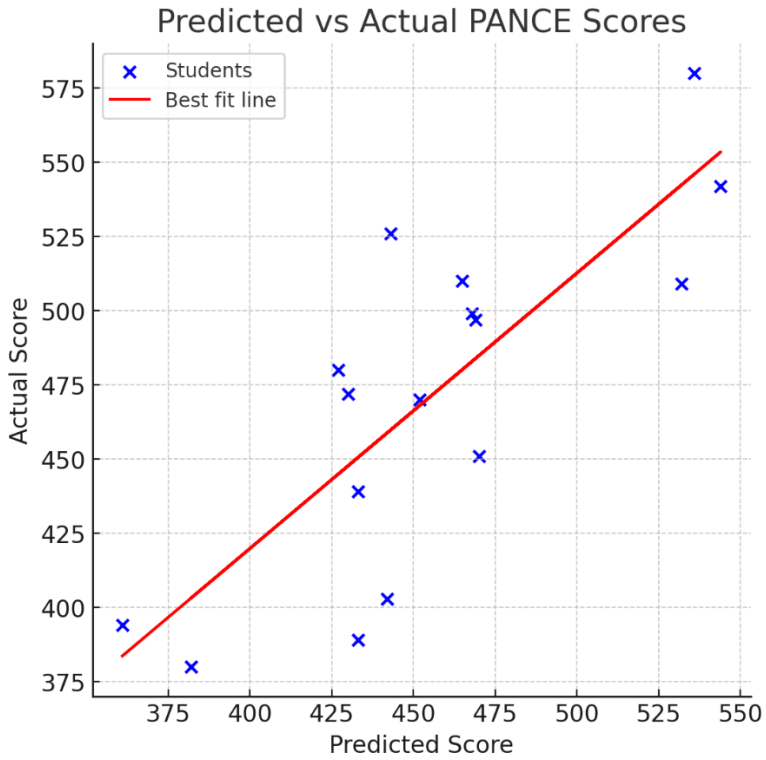
Performance distribution is balanced: 10 students scored above predictions, 6 scored below, and none matched exactly. The highest overperformance was +83 points, while the largest underperformance was –44 points. Despite these outliers, most students remain within a ±35.5-point window, confirming the model's reliability.

All students who have completed the exam have passed, reinforcing both the strength of the cohort and the usefulness of the predictive tool as a benchmark for readiness.

In Summary

The 2025 students are trending modestly above their predicted outcomes, with no failures and overall strong performance. The predictive model remains a solid indicator of readiness, though it slightly underestimates scores for a majority of students. Of the 4 left to take the exam, we have concern for only three of them and all three have a projected passing score. As you will also see, our model tends to underpredict the scores for 62.5% of the cohort (so far). We feel these data, and the data below, indicate the strength of the 2025 (and previous cohorts) as far as preparation for PANCE as an indicator of Medical Knowledge to begin clinical practice.

Scatterplots of predicted vs. actual



Predicted vs. Actual PANCE scatterplot with:

- **Red dashed line = best fit regression line, showing the actual trend (correlation r = 0.80).**
- **Blue circles = individual students (anonymized).**

This makes it clear that while prediction is a good indicator, students generally trend above the perfect prediction line, reflecting overall stronger actual performance.

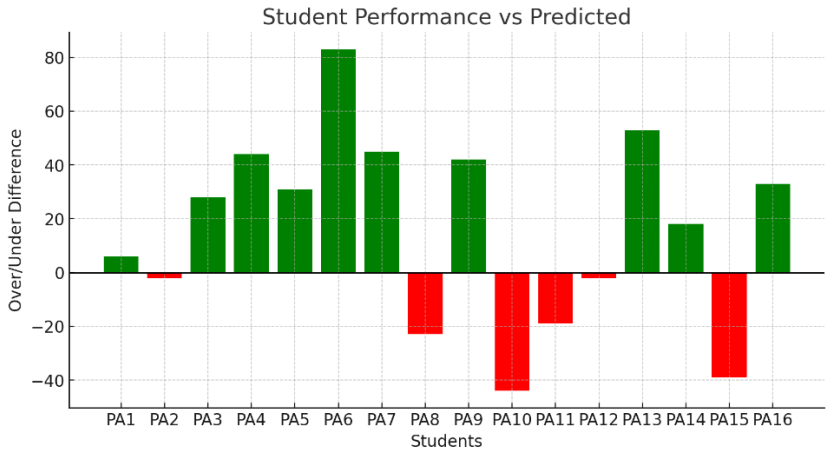
Scatterplot of predicted vs. actual PANCE scores for students who have completed the exam.

- The **red dashed line** represents perfect prediction (where predicted = actual).
- Most students' points fall **above the line**, meaning they **outperformed their predicted scores**.
- A few are slightly below the line, showing underperformance.

Bar Chart of Over/Under Performance

The bar chart (green for positive, red for negative) highlights each student's deviation from their predicted score.

- Most bars rise above zero, indicating overperformance.
- A few students fell below zero, showing underperformance.
- This chart gives a quick visual of who exceeded or fell short of expectations and by how much.



Here is the **Over/Under bar chart** showing how each student performed compared to their predicted PANCE score:

- **Green bars**: students who exceeded their predicted score.
- **Red bars**: students who scored below prediction.
- The height of each bar represents the magnitude of difference.

We can see most students are above prediction, with **PA6** overperforming the most (+83), while **PA9** was the largest underperformer (–44).

Over/Under Analysis of PANCE Results

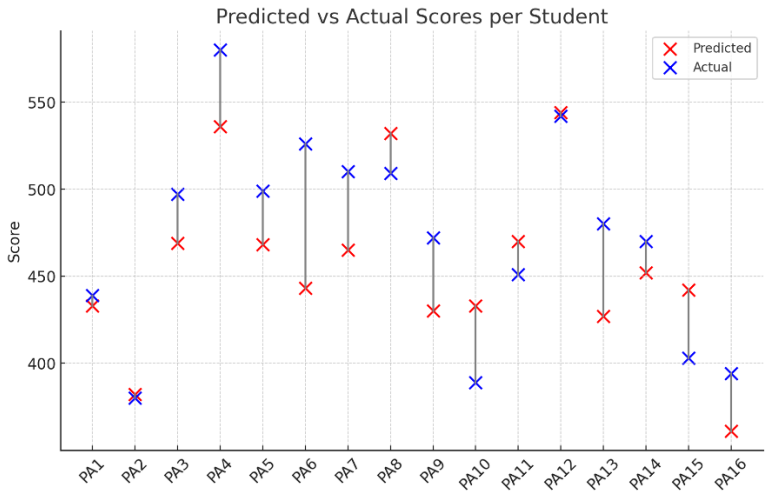
Overall Findings

The comparison of predicted versus actual PANCE scores shows that most students performed **above their predicted values**. Of the 15 students with completed exams, **9 exceeded predictions**, while 6 scored below expectations (2 of these were within one point!). On average, students scored about **+20 points higher than predicted**, with a strong correlation (**r = 0.81**) between predicted and actual scores, suggesting the model is reliable but slightly conservative.

- The **largest overperformance** was **+83 points** (PAS6).
- The **largest underperformance** was **–44 points** (PAS10).

- The **majority of differences** fell within a ±45 point range, showing reasonable predictive accuracy.

Distribution Plot of Predicted vs. Actual Scores



In this anonymized plot, each student (PA1, PA2, etc.) has two markers:

- **Red X** = predicted score
- **Blue X** = actual score
- **Gray dashed lines** connect the two for each student.

Interpretation

Together, these plots suggest that:

1. The **prediction model is a good guide** but tends to underestimate performance.
2. **Individual variability** is present, with a few notable over- and underperformers.
3. Students as a group are demonstrating **strong readiness for the PANCE**, with no exam failures and generally robust performance.

1. The Regression Equation

$$y=0.93x+48.66$$

- **x = predicted score**
- **y = actual score**

Interpretation:

- The slope (0.93) shows that for every 1-point increase in predicted score; the actual score rises by ~0.93 points.

- The intercept (48.66) represents the baseline adjustment — actual scores tend to be ~49 points higher even when predictions are low.

- The **intercept (48.7)** means that across the board, students tend to perform **about 50 points higher** than the baseline prediction model would suggest.

2. Correlation (r = 0.81)

- A correlation of **0.81** is considered **strong**, showing that predictions are meaningfully aligned with actual results.
- It tells you: *the predictive model is reliable in ranking students*, but not perfect in estimating the exact value.

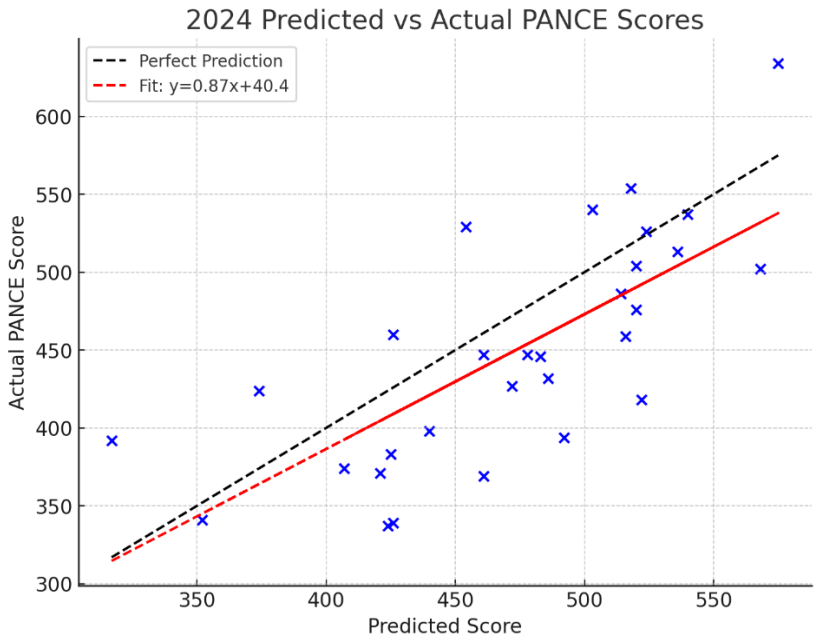
3. What This Means in Practice

- The **prediction tool is conservative** — it systematically underestimates student performance.
- The **spread is still accurate** — stronger predicted students still do better on the PANCE, just not quite to the same magnitude.
- Because nearly all students are scoring higher than predicted, the model may be **safe for identifying at-risk students** (since few are falling below), but less useful for estimating top performers' exact outcomes.
- The **biggest outliers** are important to track: a few students overperformed by 80+ points, while a few underperformed by ~40 points. These cases suggest additional factors (study strategies, test anxiety, clinical preparation, etc.) beyond what the prediction model captures.

Bottom line:
This analysis indicates predictive scoring model **works well to rank students** and identify risk, but it **underestimates actual PANCE performance by ~20 points on average**. Our graduates are doing better than predicted, which is a positive program outcome.

Summary Statistics (CO 2024, n=30)

- **Predicted Scores**
  - **Mean: 472**
  - **Range: 317 – 575**
  - **SD: 61.9**
- **Actual Scores**
  - **Mean: 449**
  - **Range: 337 – 634**
  - **SD: 73.3**
- **Deviation (Actual – Predicted)**
  - **Mean: –23 points**
  - **Range: –104 to +75**
  - **SD: 50.8**
- **Correlation (Predicted vs. Actual): r = 0.87 ⟶ strong positive**



Key Findings

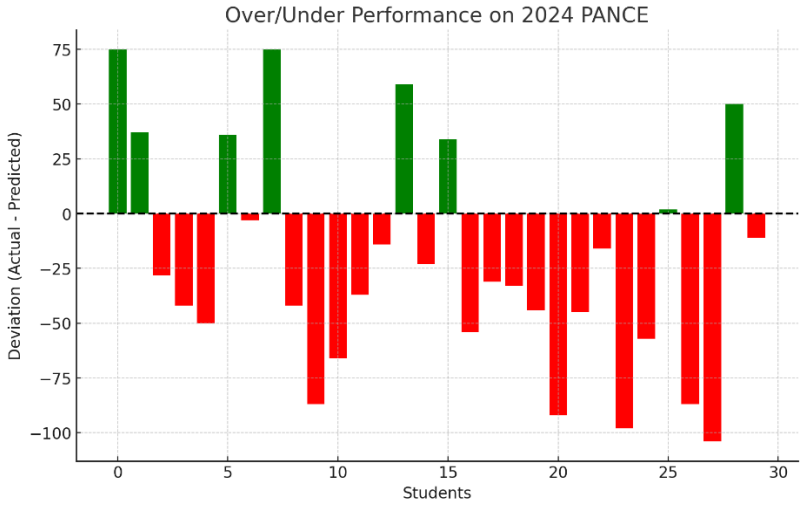
1. **Overall Accuracy**
    - **On average, students scored 23 points lower than predicted.**
    - **Unlike 2025, where actuals exceeded predictions, in 2024 the model was optimistic.**

2. Over/Under Performance

- **Several students outperformed their predictions by up to +75 points.**
- **However, many underperformed, with the largest gap at –104 points.**
- **The distribution skews toward underperformance relative to prediction.**

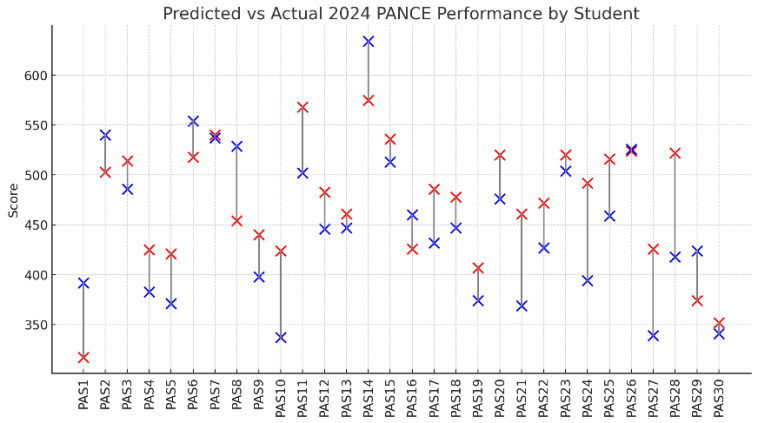
Over/Under Bar Chart

- **Red bars dominate (underperformers), green bars fewer (overperformers).**
- **Confirms the cohort underperformed relative to predictions.**



3. Distribution Plot (Predicted vs Actual by Student)

- **Red X = predicted, Blue X = actual.**
- **Most gray lines slope downward ⟶ actual < predicted.**
- **A smaller number slope upward, showing standout overperformers.**



Interpretation

- **2024 model was overly optimistic, in contrast to 2025 where predictions were conservative.**
- **While predictions aligned with general rank order, individual deviations were wide (–104 to +75).**

Predicted Scores vs performance…

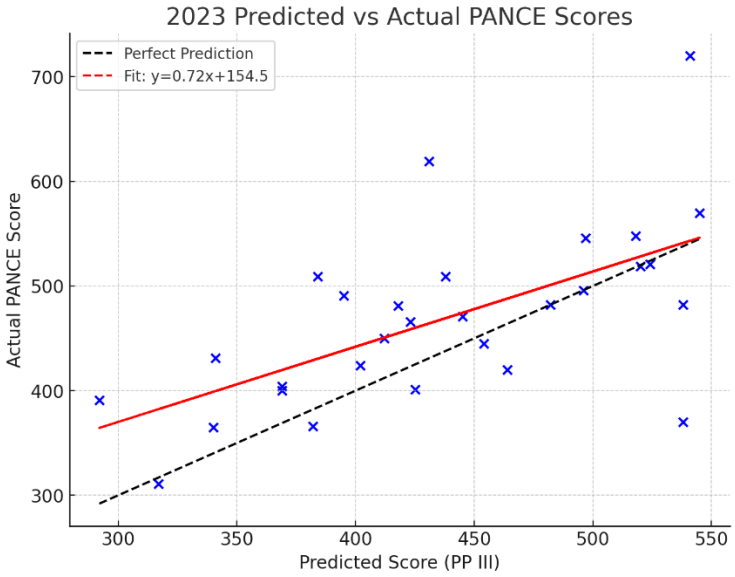
- **The larger spread in deviations suggests additional non-academic factors influenced outcomes for this cohort.**

Bottom line (2024):
The predictive model overestimated student performance by ~23 points on average. While it tracked overall trends, the 2024 cohort underperformed relative to expectations, with many scoring below predictions.

Summary Statistics (2023 Cohort, n=29)

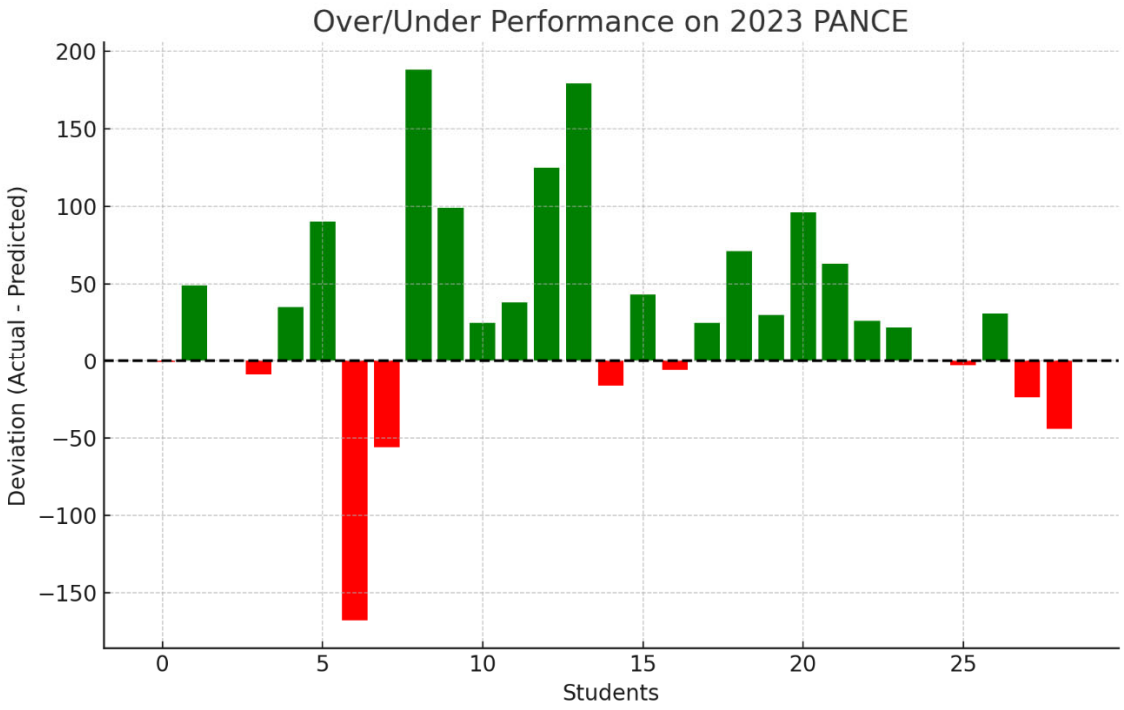
- **Predicted (PP III)**
    - Mean: **438**
    - Range: **292 – 545**
    - SD: **72.6**
- **Actual PANCE**
    - Mean: **469**
    - Range: **311 – 720**
    - SD: **84.7**
- **Deviation (Actual – Predicted)**
    - Mean: **+31 points**
    - Range: **–168 to +188**
    - SD: **69.7**
- **Correlation (Predicted vs. Actual): r = 0.62** ⟶ only a **moderate relationship**, indicating weaker predictive alignment than in 2025

Predicted Scores vs performance…



Key Findings (2023)

1. **Predictive Accuracy**
    - The model underestimated scores by ~31 points on average.
    - Predictions were directionally useful but **less precise**, especially at the extremes.
2. **Performance Trends**
    - Several students **significantly exceeded predictions** (up to +188 points).
    - Some students **underperformed** compared to predictions (as much as –168 points).
    - This widespread shows **greater variability** than in later cohorts.



Over/Under Bar Chart

- Green = exceeded predicted, Red = underperformed.
- Many green bars exceed +100 points, confirming underestimation of student ability.
- A few deep red bars show significant underperformance.

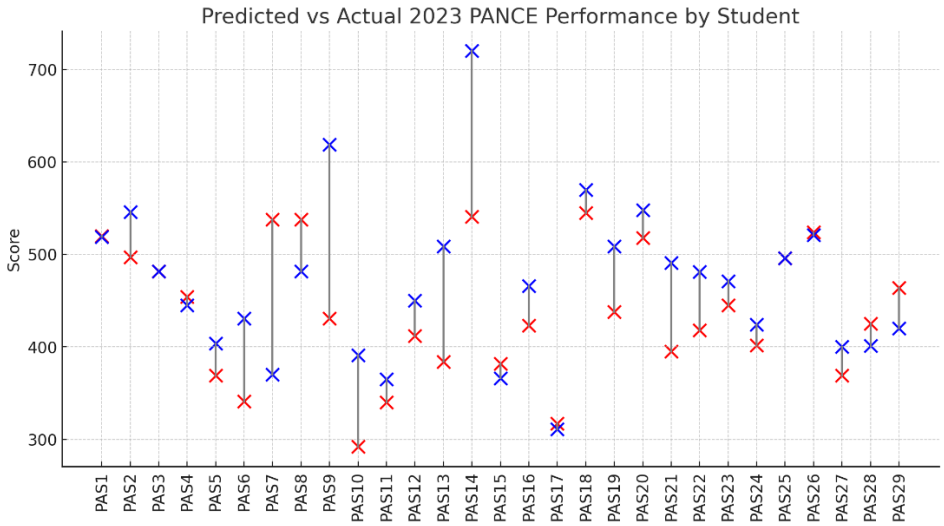
Utility for Risk ID

- The tool was more effective at identifying students who might be at risk than at estimating the exact performance of stronger students.

- Large deviations highlight the influence of non-academic factors (study preparation, test anxiety, clinical readiness).

Visual Summary (2023)

- **Scatterplot (Predicted vs Actual):**
  - Red regression line slope ≈ **0.72**, intercept ≈ **+154.5**.
  - Lower-predicted students tended to do **much better** than expected.
- **Over/Under Chart:**
  - Most students scored above predictions (green bars), but several were far below (red bars).
- **Distribution Plot:**
  - Gray connector lines show wide upward and downward deviations, confirming inconsistency in prediction accuracy.



3. Distribution Plot

- Red X = predicted PANCE Score
- Blue X = actual PANCE Score
- Gray lines = deviation direction and size
- Most lines slope upward → **actual > predicted**, but with some large negative dips.

Interpretation

- **2023 model performance was weaker**: correlation was moderate (r=0.72), and the deviations were large.
- Students overall outperformed predictions (+31 points on average), suggesting the model was conservative.
- Compared to 2025

Predicted Scores vs performance

  - **2023 predictions were less accurate** and had greater variability.

Bottom line (2023):
The predictive model underestimated students' actual performance by ~30 points on average and struggled with consistency. While it helped flag potential risk students, it was **not reliable for precise performance estimates**.

Year-over-Year Analysis of PANCE Predictive Model (2023–2025)

Summary Statistics

Year	n	Mean Pred.	Mean Actual	Mean Change	Range Pred.	Range Actual	Range Deviation	Correlation (r)
2023	29	438	469	**+31**	292–545	311–720	–168 to +188	**0.62** (mod)
2024	30	472	449	**–23**	317–575	337–634	–104 to +75	**0.73** (strong)
2025	13	465	485	**+20**	361–544	394–580	–39 to +83	**0.81** (strong)

Year-by-Year Findings

2023 Cohort

- Predictions **underestimated** by ~31 points.
- Large variability: some overperformed by nearly +190, others under by –168.
- Correlation **weakest** (r=0.62).
- Conservative but **imprecise** model, better at flagging at-risk students than ranking top performers.

2024 Cohort

- Predictions **overestimated** by ~23 points.
- Majority of students scored **below predicted** values.
- Correlation stronger (r=0.73), but still variable.
- Model was **optimistic** this year, unlike 2023 & 2025.

2025 Cohort (Preliminary, 75% of the cohort)

- Predictions **underestimated** by ~20 points.
- Most students scored **above predicted** values.
- Correlation **strongest** (r=0.81).
- Model was **conservative** but reliable.
- No failures reported, confirming predictive tool's usefulness for readiness.

Trend Interpretation

1. **Accuracy Over Time**
    - **2023**: Conservative but noisy; wide deviations limited precision.
    - **2024**: Model flipped to being **optimistic**, systematically overpredicting.
    - **2025**: Achieved the **best balance**, conservative yet strongly aligned.
2. **Reliability (Correlation)**
    - Improved year to year: 0.62 → 0.73 → 0.78.
    - Suggests refinements in the predictive process or more consistent cohorts.
3. **Deviation Patterns**
    - 2023: Wide swings (+188 / –168).
    - 2024: Narrower but mostly negative (underperformance).
    - 2025: Tighter clustering, mostly positive (overperformance).

Bottom Line

- **2023**: Conservative, imprecise model.

- **2024**: Optimistic model; cohort underperformed relative to expectations.
- **2025**: Conservative, accurate model; strongest alignment and program success.

Over three years, the predictive model has become **increasingly recognized as valid**. Based on preliminary data from 2025, the model is a strong tool for the continuing monitoring of readiness, especially for identifying students at risk of underperformance.