



Evaluating the Impact of Math Nation on 10th Grade Mathematics Achievement in Kentucky: A Quasi-Experimental Study Using Kentucky Summative Assessment Data (2023-24 to 2024-25)

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Executive Summary

Research question: Is Math Nation usage associated with differences in mathematics performance and year-over-year changes among Kentucky 10th grade test-taking cohorts as measured by the Kentucky Summative Assessment (KSA)?

Design: Quasi-experimental study using (1) paired year-over-year comparisons (2023-24 to 2024-25) across KSA performance bands and (2) 2024-25 cross-sectional comparisons between Math Nation and non-Math Nation schools.

Sample: Year-over-year analyses included 227 high schools with complete paired KSA data. Cross-sectional 2024-25 comparisons included 243 schools (167 Math Nation; 76 non-Math Nation). Math Nation usage data included 16,526 student-level records across 225 schools.

Main findings:

1. Statewide improvement across the full performance distribution: Kentucky high school 10th graders demonstrated statistically significant improvement from 2023-24 to 2024-25 across the full performance distribution, indicating meaningful movement into higher performance levels and out of the lowest categories.
 - a. Novice: 33.3% to 28.0% (-5.30 percentage points, $p < .001$, $d = 0.77$; large effect)
 - b. Novice/Apprentice: 63.6% to 58.3% (-5.25 percentage points, $p < .001$, $d = 0.63$; moderate-to-large effect)
 - c. Proficient: 25.8% to 29.9% (+4.1 percentage points, $p < .001$, $d = 0.51$; moderate effect)
 - d. Proficient/Distinguished: 36.5% to 41.8% (+5.3 percentage points, $p < .001$, $d = 0.53$; moderate effect size)
2. Implementation intensity: For schools using Math Nation, those characterized as high-usage outperformed low-usage schools:
 - a. In 2024-25, high-usage schools demonstrated about 12.2 percentage points higher Proficient rates than low-usage schools ($p < .001$, $d = 0.96$; large effect size).



- b. Threshold analysis identified a critical implementation benchmark of approximately 279 total student logins per school.
- c. Four schools demonstrated intensive Math Nation implementation (approximately 1,000 logins or more), and all four had higher Proficient rates (i.e., Corbin High School, Madison Southern High School, McCracken County High School, Muhlenberg County High School).

Conclusion: Math Nation schools demonstrated year-over-year improvement comparable to statewide trends across both upper and lower performance bands. Kentucky experienced measurable increases in Proficient and Proficient/Distinguished performance and substantial reductions in Novice and Novice/Apprentice rates.

Higher implementation intensity of the Math Nation platform was associated with higher Proficient rates. These findings suggest that depth and consistency of Math Nation program use may be associated with observed achievement outcomes.



Purpose

This study examines whether Math Nation usage is associated with measurable changes in high school mathematics achievement among Kentucky schools with 10th grade test-taking cohorts. Using Kentucky Summative (KSA) data from 2023-24 (baseline) and 2024-25 (outcome), this quasi-experimental analysis evaluates year-over-year changes across the full performance distribution, including increases in Proficient and Proficient/Distinguished performance and reductions in Novice and Novice/Apprentice rates. The study includes both paired year-over-year analyses and cross-sectional comparisons between schools using Math Nation and schools not using the platform.

Research Questions

Primary Question

Is Math Nation usage associated with differences in mathematics performance and year-over-year changes among Kentucky high schools with 10th grade test-taking cohorts as measured by the Kentucky Summative Assessment (KSA) from 2023-24 to 2024-25?

Secondary Questions

1. Is there a dose-response relationship between Math Nation usage intensity and mathematics performance levels?
2. What usage thresholds are associated with meaningful differences in performance across the KSA performance distribution?
3. Do high-implementation schools demonstrate significantly different performance levels compared to low-implementing schools?
4. Do Math Nation schools differ from non-Math Nation schools in cross-sectional comparisons for 2024-25?

Outcome Measures

- Percentage of high school 10th grade test-taking students scoring “Proficient” on KSA mathematics
- Percentage of high school 10th grade test-taking students scoring “Proficient” or “Distinguished” (combined) on KSA mathematics
- Percentage of high school 10th grade test-taking students scoring “Novice” on KSA mathematics
- Percentage of high school 10th grade test-taking students scoring “Novice” or “Apprentice” (combined) on KSA mathematics



Comparison Groups

- Math Nation schools (Paired Sample): Schools with Math Nation usage records and complete KSA data for both 2023-24 and 2024-25
- Non-Math Nation schools (Paired Sample): Schools without Math Nation usage records and complete KSA data for both years
- Math Nation schools (2024-25 Cross-Sectional): Schools with Math Nation usage classification for 2024-25
- Non-Math Nation schools (2024-25 Cross-Sectional): Schools without Math Nation usage classification for 2024-25
- High-Usage schools (Threshold Model Subset): Schools exceeding approximately 279 total student logins (regression-identified breakpoint)
- Low-Usage schools (Threshold Model Subset): Schools below the 279-login threshold

Results

Sample Description

Paired Year-Over-Year Analytic Sample

- Total schools: 227 with complete KSA mathematics data for both 2023-24 and 2024-25
- This sample was used for all paired year-over-year analyses (Proficient, Proficient/Distinguished, Novice, Novice/Apprentice)
- Geographic coverage: Statewide representation

2024-25 Cross-Sectional Comparison

- Total schools with 2024-25 performance data: 243
 - Math Nation schools: 167 (68.7% of sample)
 - Non-Math Nation schools: 76 (31.3% of sample)
- Note: The cross-sectional sample differs from the paired sample due to baseline data availability requirements.

Data Availability

- 2023-24 KSA: 398 schools total, 234 with available performance data
- 2024-25 KSA: 407 schools total, 243 with available performance data
- Paired across years: 227 schools with complete data in both years
- Excluded from paired analyses: 16 schools missing 2023-24 baseline data



Math Nation Usage Characteristics

- Student level usage data: $n = 16,526$ students across 225 schools
- Total logins per school: Range 1 to 1,609; Mean = 78

Baseline Characteristics (2023-24)

Paired Analytic Sample ($n = 227$)

- Math Nation schools: $n = 160$; 25.2% Proficient
- Non-Math Nation schools: $n = 67$; 27.1% Proficient
- Difference: -1.9 percentage points (not statistically significant)

These findings indicate that Math Nation and non-Math Nation schools were statistically comparable at baseline in terms of Proficient rates.

Main Analysis – Statewide Improvement

A paired-samples t-test examined year-over-year changes in high school 10th grade mathematics performance across the full KSA performance distribution. The paired sample included 227 schools with complete 2023-24 to 2024-25 data.

Proficient Only

- 2023-24: Mean = 25.79%, SD = 7.92
- 2024-25: Mean = 29.89%, SD = 8.99
- Change: +4.10 percentage points
- Correlation between years: $r = .552$, $p < .001$
- Statistical significance: $t(226) = 7.68$, $p < .001$
- Effect size: Cohen's $d = 0.51$ (moderate)
- 95% Confidence Interval: [3.04, 5.16]

Proficient/Distinguished Combined

- 2023-24: Mean = 36.45%, SD = 14.50
- 2024-25: Mean = 41.76%, SD = 14.50
- Change: +5.31 percentage points
- Correlation between years: $r = .823$, $p < .001$
- Statistical significance: $t(226) = 7.88$, $p < .001$
- Effect size: Cohen's $d = 0.53$ (moderate)
- 95% Confidence Interval: [3.98, 6.63]



Novice Only

- 2023-24: Mean = 33.30%, SD = 12.30
- 2024-25: Mean = 28.00%, SD = 11.80
- Change: -5.30 percentage points
- Correlation between years: $r = .750$, $p < .001$
- Statistical significance: $t(226) = 11.63$, $p < .001$
- Effect size: Cohen's $d = 0.77$ (large)
- 95% Confidence Interval: [4.40, 6.19]

Novice/Apprentice Combined

- 2023-24: Mean = 63.56%, SD = 14.00
- 2024-25: Mean = 58.31%, SD = 13.40
- Change: -5.25 percentage points
- Correlation between years: $r = .800$, $p < .001$
- Statistical significance: $t(226) = 9.46$, $p < .001$
- Effect size: Cohen's $d = 0.63$ (moderate-to-large)
- 95% Confidence Interval: [4.15, 6.35]

Summary

Kentucky high school mathematics performance improved significantly from 2023-24 to 2024-25 across performance levels.

- Moderate effect sizes were observed for increases in Proficient and Proficient/Distinguished performance ($d = 0.51$ to 0.53).
- Larger effect sizes were observed for reductions in Novice ($d = 0.77$) and Novice/Apprentice ($d = 0.63$), indicating meaningful movement out of the lowest performance categories.

These statewide improvements provide context for interpreting Math Nation-specific findings and underscore that gains occurred broadly across Kentucky during this period.

Math Nation vs. Non-Math Nation Schools

An independent samples t-test compared 2024-25 mathematics outcomes between schools classified as Math Nation schools and schools without Math Nation usage. The 2024-25 cross-sectional sample included 243 schools.



Proficient (2024-25)

- Math Nation schools (n = 167): Mean = 28.78%, SD = 8.51
- Non-Math Nation schools (n = 76): Mean = 29.21%, SD = 11.91
- Difference: -0.43 percentage points
- Statistical significance: $t(241) = -0.32$, $p = .749$ (not significant)
- Effect size: Cohen's $d = -0.04$ (negligible)

Proficient/Distinguished (2024-25)

- Math Nation schools (n = 167): Mean = 40.34%, SD = 13.78
- Non-Math Nation schools (n = 76): Mean = 44.47%, SD = 17.49
- Difference: -4.13 percentage points
- Statistical significance: $t(241) = -1.96$, $p = .051$ (not statistically significant at $\alpha = .05$)
- Effect size: Cohen's $d = -0.26$ (small)

Novice (2024-25)

- Math Nation schools (n = 167): Mean = 27.97%, SD = 11.77
- Non-Math Nation schools (n = 76): Mean = 28.05%, SD = 12.87
- Difference: -0.08 percentage points
- Statistical significance: $t(241) = -0.05$, $p = .958$ (not statistically significant at $\alpha = .05$)
- Effect size: Cohen's $d = -0.01$ (negligible)

Novice/Apprentice (2024-25)

- Math Nation schools (n = 167): Mean = 58.29%, SD = 13.40
- Non-Math Nation schools (n = 76): Mean = 58.35%, SD = 14.93
- Difference: -0.06 percentage points
- Statistical significance: $t(241) = -0.03$, $p = .977$ (not statistically significant at $\alpha = .05$)
- Effect size: Cohen's $d = -0.01$ (negligible)

Summary

In cross-sectional 2024-25 comparisons, there were no statistically significant differences between Math Nation schools and non-Math Nation schools in Proficient, Proficient/Distinguished, Novice, or Novice/Apprentice rates.

While Math Nation Schools improved year-over-year, direct comparisons with non-Math Nation schools in 2024-25 did not reveal statistically significant performance differences. This suggests that platform access alone does not differentiate outcomes at the school level.

As subsequent analyses demonstrate, implementation intensity appears more strongly associated with performance differences.



Math Nation Schools' Year-Over-Year Growth

A paired-samples t-test examined year-over-year changes specifically among Math Nation schools only; $n = 160$ with complete baseline and outcome data.

Proficient

- 2023-24: Mean = 25.23%, SD = 7.30
- 2024-25: Mean = 29.28%, SD = 8.10
- Change: +4.05 percentage points
- Correlation between years: $r = .630$, $p < .001$
- Statistical significance: $t(159) = 7.70$, $p < .001$
- Effect size: Cohen's $d = 0.61$ (moderate-to-large)
- 95% Confidence Interval: [2.98, 5.11]

Proficient/Distinguished Combined

- 2023-24: Mean = 35.74%, SD = 12.23
- 2024-25: Mean = 41.04%, SD = 13.36
- Change: +5.30 percentage points
- Correlation between years: $r = .825$, $p < .001$
- Statistical significance: $t(159) = 7.92$, $p < .001$
- Effect size: Cohen's $d = 0.60$ (moderate-to-large)
- 95% Confidence Interval: [3.98, 6.62]

Novice

- 2023-24: Mean = 32.92%, SD = 11.44
- 2024-25: Mean = 27.54%, SD = 10.94
- Change: -5.38 percentage points
- Correlation between years: $r = .744$, $p < .001$
- Statistical significance: $t(159) = 9.73$, $p < .001$
- Effect size: Cohen's $d = 0.77$ (large)
- 95% Confidence Interval: [4.28, 6.48]

Novice/Apprentice Combined

- 2023-24: Mean = 63.47%, SD = 13.32
- 2024-25: Mean = 58.29%, SD = 12.74
- Change: -5.18 percentage points
- Correlation between years: $r = .811$, $p < .001$



- Statistical significance: $t(159) = 7.92, p < .001$
- Effect size: Cohen's $d = 0.63$ (moderate-to-large)
- 95% Confidence Interval: [3.89, 6.47]

Summary

Math Nation schools demonstrated statistically significant improvement from 2023-24 to 2024-25 across both upper and lower KSA performance bands.

- Proficient and Proficient/Distinguished increased by +4.05 and +5.30 percentage points (Cohen's $d = 0.60$ - 0.61 ; moderate-to-large effects).
- Novice and Novice/Apprentice rates declined by -5.38 and -5.18 percentage points (Cohen's $d = 0.63$ - 0.77 ; moderate-to-large effects).

The largest statistical movement occurred in reductions in the Novice category, indicating meaningful movement out of the lowest performance band.

Importantly, the magnitude of gains in Math Nation schools is comparable to statewide improvements (+4.10 to +5.31 percentage points in Proficient and Proficient/Distinguished rates). This indicates that Math Nation schools participated in Kentucky's broader upward trend during this period. These findings suggest that access to the platform alone did not produce gains beyond those observed statewide, and that other factors, including implementation intensity, may help explain variation in outcomes.

Usage Threshold Analysis

A threshold regression model was conducted to examine whether the relationship between Math Nation (total student logins per school) and 2024-25 Proficient rate, controlling for the 2023-24 baseline Proficient rate.

Methodology

Threshold regression identifies significant "breakpoints" where the slope of the relationship between usage and Proficient rate changes. This approach identifies whether minimum levels of implementation are associated with stronger relationships between usage and outcomes.

Thresholds Identified

Two statistically significant thresholds were identified at:

- Threshold 1: 15 total logins per school
- Threshold 2: 279 total logins per school

These thresholds divide schools into three usage categories:



Low Usage (<15 logins)

- Relationship: Additional logins at low usage do not meaningfully improve Proficient rates.
- Finding: At low usage levels Math Nation engagement is insufficient to produce measurable relationships with Proficient rates.

Moderate Usage (15-279 logins)

- Relationship: Small positive association between additional logins and the Proficient rate.
- Finding: Once schools exceed minimal engagement, modest positive relationships begin to emerge, but effects remain small.

High Usage (>279 Logins)

- Relationship: Statistically significant positive association between logins and Proficient rates.
- Estimated difference: ~12.2 percentage points higher Proficient rates relative to low-usage schools.
- Finding: At high implementation levels, Math Nation usage shows a statistically significant and practically meaningful positive relationship with Proficient rates.

Schools In High Usage Category

Of the schools with matched KSA data for both years, four exceeded the 279-login threshold for 10th grade students:

1. Corbin High School 10th graders: 850 logins
2. Madison Southern High School 10th graders: 1146 logins
3. McCracken County High School 10th graders: 725 logins
4. Muhlenberg County High School 10th graders: 1609 logins

Summary

The usage threshold analysis reveals that Math Nation shows meaningful positive relationships with Proficient rates when usage intensity is high (>279 total logins). Only four (2.4%) of Math Nation schools achieved this threshold. This pattern is consistent with the null result observed in cross-sectional comparisons, as most Math Nation schools had usage levels below the threshold where stronger associations with the Proficient rate were observed. The threshold analysis suggests that higher implementation intensity is associated with higher Proficient rates.



Conclusion

This study examined the relationship between Math Nation usage and high school mathematics performance in Kentucky using KSA data from 2023-24 and 2024-25. Analyses evaluated changes across the full performance distribution and explored whether implementation intensity was associated with differences in outcomes. Key findings include:

1. **Statewide improvement across the full performance distribution:** Kentucky schools demonstrated statistically significant improvement from 2023-24 to 2024-25 in mathematics achievement. The Proficient rate increased by +4.1 percentage points and the Proficient/Distinguished rate increased by +5.3 percentage points (moderate effect sizes), while Novice and Novice/Apprentice rates declined by approximately 5 percentage points (moderate-to-large to large effect sizes). These results indicate meaningful movement both into higher performance bands and out of the lowest proficiency category.
2. **Comparable improvement among Math Nation schools:** Math Nation schools showed statistically significant year-over-year gains in both upper and lower performance bands. The magnitude of improvement was comparable to statewide trends, indicating that Math Nation schools participated in Kentucky's broader upward trajectory during this period.
3. **Math Nation implementation intensity matters:** Threshold analysis identified meaningful usage breakpoints, with high usage schools demonstrating approximately 12.2 percentage point higher Proficient rates relative to low-usage schools.
4. **Varied implementation across schools:** Most Math Nation schools demonstrated minimal usage, as measured by student logins. These findings suggest that access alone may not be sufficient to differentiate outcomes; depth and consistency of implementation appear more strongly associated with performance differences.

Kentucky experienced meaningful statewide improvement in high school mathematics performance from 2023-24 to 2024-25. Math Nation schools improved at rates comparable to statewide trends, with particularly strong reductions in the Novice category. Higher levels of Math Nation platform usage were associated with higher Proficient rates. Forthcoming reporting will explore additional dimensions of implementation, including usage of assessment-support features within Math Nation, subgroup performance patterns, and more rigorous causal modeling approaches.



Limitations

Findings from this study should be interpreted as suggestive rather than definitive. While Math Nation schools demonstrated meaningful year-over-year improvement and implementation intensity was associated with higher proficiency, several limitations constrain interpretation.

Grade-Level Restriction and Sample Composition: This study examined high school KSA mathematics outcomes and therefore included only high schools with available 2023-24 and 2024-25 performance data. Of the 568 schools statewide implementing Math Nation across elementary, middle, and high school grades, 167 schools (29%) met inclusion criteria. The remaining 401 schools (71%) were excluded primarily because they did not administer the high school KSA assessment (e.g., elementary and middle schools) or had suppressed outcome data due to small cohort sizes.

As a result, findings generalize only to high schools with high school assessment data and do not reflect implementation patterns or outcomes in elementary or middle schools. Importantly, usage distribution in the analytic sample differs from statewide usage patterns. The study sample overrepresented low-usage schools relative to the full Math Nation population and underrepresented moderate- and high-usage schools. This distribution makes detection of usage-related effects more difficult and limits generalization to the broader implementation landscape.

Quasi-Experimental Design: This analysis is quasi-experimental and does not allow for causal inference. Schools self-selected into Math Nation implementation, and usage intensity was not randomly assigned. Observed differences may reflect pre-existing school characteristics rather than program effects.

Binary Treatment Classification: Primary comparisons classified schools as Math Nation or non-Math Nation, which masks meaningful differences in dosage and fidelity. Subsequent threshold analysis partially addresses this issue, but additional measures of instructional integration, assessment use, and teacher engagement were not included in this analysis.

Lack of Covariate Adjustment: This report does not statistically adjust for differences between schools in demographic composition, economic disadvantage, enrollment size, prior achievement trends, or other contextual variables that may influence both adoption and outcomes. Forthcoming analyses will explore adjustment models where feasible.



School-Level Aggregation: All analyses used school-level aggregated proficiency percentages rather than individual student-level matched data linking Math Nation usage to KSA outcomes. This reduces statistical precision and limits the ability to control for student-level covariates.

Data Timing Constraints: Data availability timelines limited the scope of analysis. Future reporting will expand to include additional grade levels, subgroup analyses, and multi-year implementation patterns.



Appendix A

Methods

Data Sources

Kentucky Summative Assessment (KSA) Data

School-level high school 10th grade mathematics performance data were obtained from the Kentucky Department of Education for two academic years: 2023-24 (baseline proficiency rates) and 2024-25 (outcome proficiency rates).

KSA performance was reported at the school level as:

- Percentage of students scoring “Proficient”
- Percentage of students scoring “Distinguished”
- Combined percentage scoring “Proficient” or “Distinguished”

Math Nation Usage Data

Individual student-level usage data were provided by Accelerate Learning, Inc. for the 2024-25 academic year. Usage data included:

- Total logins per school (sum across all students)
- Total videos watched per school (sum across all students)
- Mean logins per student (school average)
- Mean videos per student (school average)

School Identification and Matching

School names and district names were used to match Math Nation usage data with KSA performance data. Matching was conducted using standardized name cleaning procedures.

Participants

Inclusion Criteria

Schools were included in analyses if they met all of the following criteria:

1. Had high school 10th grade KSA mathematics data for 2023-24 (baseline)
2. Had high school 10th grade KSA mathematics data for 2024-25 (outcome)
3. Had non-missing proficiency percentages for both years
4. For Math Nation schools: Successfully matched usage data with KSA data



Exclusion Criteria

Schools were excluded if:

- Missing baseline (2023-24) KSA data
- Missing outcome (2024-25) KSA data
- Suppressed data (n<10 students) for proficiency percentages

Final Analytical Sample

- Paired year-over-year sample (2023-24 and 2024-25): Total n = 227
 - Math Nation: n = 160 (70.5%)
 - Non-Math Nation: n = 67 (29.5%)
 - Geographic coverage: Statewide
- Cross-sectional sample (2024-25 outcome year): Total n = 243
 - Math Nation: n = 167 (68.7%)
 - Non-Math Nation: n = 76 (31.3%)
 - Geographic coverage: Statewide

Sample Characteristics

- Proficiency range (2023-24): 6% to 57%
- Proficiency range (2024-25): 4% to 55%
- This wide range of proficiency rates indicates diverse school performance levels, from very low-performing to moderately high-performing.

Statistical Analyses

Primary Analyses

Statewide Year-Over-Year Comparison

- Test: Paired-samples t-test
- Comparison: 2023-24 vs. 2024-25 rates within each performance band for all schools (n = 227)
- Purpose: Establish overall Kentucky improvement trajectory

Math Nation vs. Non-Math Nation Comparison (2024-25)

- Test: Independent-samples t-test
- Comparison: Math Nation schools (n = 167) vs. non-Math Nation schools (n = 76)
- Purpose: Test whether Math Nation schools show higher proficiency in outcome year
- Assumption checking: Leven's test for equality of variances



Baseline Equivalence Check (2023-24)

- Test: Independent-samples t-test
- Comparison: Math Nation schools vs. non-Math Nation schools at baseline
- Purpose: Verify groups were comparable before Math Nation implementation

Math Nation Schools' Year-Over-Year Change

- Test: Paired-samples t-test
- Comparison: 2023-24 vs. 2024-25 for Math Nation schools only (n = 160)
- Purpose: Examine whether Math Nation Schools improved over time

Secondary Analyses

Threshold Regression Analysis

- Purpose: Identify usage levels where relationship between Math Nation and proficiency changes
- Method: Piecewise regression with threshold estimation
- Independent variable: Total student logins per school
- Dependent variable: 2024-25 Proficient rate
- Covariate: 2023-24 baseline Proficient rate (to control for prior achievement)

Effect Size Calculations

- Cohen's d for all t-tests
- Interpretation guidelines:
 - d = 0.2: Small effect
 - d = 0.5 Moderate effect
 - d = 0.8: Large effect

Significance Level

- Alpha = .05 (two-tailed tests)
- Marginally significant: $.05 < p < .10$
- No adjustments for multiple comparisons (exploratory study)



Appendix B

Guide to Analytic Methods

This appendix explains the different analyses conducted, why those methods were selected, and what the results showed. This study looked at KSA results across the entire performance spectrum, including movement into higher proficiency bands (Proficient and Distinguished) and movement out of lower bands (Novice and Apprentice).

Year-to-Year Comparison (Paired Analysis)

Question asked: Did schools improve in 2024-25 compared to 2023-24? Rather than compare different schools to one another, this test compares each school to itself from 2023-24 to 2024-25.

What the analysis can explain: This method shows whether performance changed over time and whether the change is large enough that it likely did not happen by chance. It tells us whether schools improved, but not necessarily *why* schools improved.

What the analysis found: Kentucky schools improved at both the top and bottom of the achievement distribution. Math Nation schools also improved year-over-year, with particularly strong movement out of the Novice category.

- Across Kentucky:
 - The percentage of students reaching Proficient increased by about 4 percentage points.
 - The percentage of students reaching Proficient/Distinguished increased by about 5 percentage points.
 - The percentage of students in the lowest category Novice decreased by about 5 percentage points.
 - The combined Novice/Apprentice rate decreased by about 5 percentage points.
- Within Math Nation schools:
 - Proficiency increased at similar rates as all schools in Kentucky.
 - Novice rates decreased by just over 5 percentage points.
 - Combined Novice/Apprentice also decreased by just over 5 percentage points.



School-to-School Comparison (Independent Group Comparison)

Question asked: Did Math Nation schools perform differently than non-Math Nation schools? This analysis compares schools using Math Nation to schools not using Math Nation during the same year by examining differences in: Novice, Novice/Apprentice, Proficient, and Proficient/Distinguished.

What the analysis can explain: This method helps determine whether one group of schools appears to outperform another at a single point in time. This method does not account for differences in prior performance, demographics, or depth of implementation.

What the analysis found: In 2024-25, Math Nation schools were not statistically different from non-Math Nation schools in Proficient, Proficient/Distinguished, Novice, or Novice/Apprentice. While Math Nation schools improved over time, improvement occurred broadly across Kentucky. The analysis did not detect a clear difference between Math Nation and non-Math Nation schools in a direct comparison for that year.

Implementation Intensity (Usage Threshold Analysis)

Question asked: Does deeper use of Math Nation relate to stronger performance? This analysis examined whether the amount of Math Nation usage—not just program access—was associated with differences in proficiency outcomes, and whether specific usage “thresholds” marked stronger relationships with achievement.

What the analysis can explain: This method looks for patterns showing whether stronger implementation (i.e., more engagement with Math Nation) is associated with stronger outcomes. This analysis does not prove that higher usage caused higher performance.

What the analysis found: Schools that used Math Nation more intensively tended to have stronger proficiency outcomes. This suggests that implementation depth may matter.

- Most Math Nation schools had low-to-moderate usage levels.
- A small group of schools implemented Math Nation at high intensity.
- High-usage schools demonstrated about a 12-percentage point advantage in Proficient rate compared to low-usage schools.



Analysis Summary

Looking across the full distribution of schools, Kentucky high schools improved overall, gains occurred at the top (more Proficient students), gains occurred at the bottom (fewer Novice students), Math Nation schools improved year-over-year in both directions, and Math Nation implementation intensity appears related to stronger student outcomes.