AMIRA
L E A R N I N G

Using Istation Math Computer-Adaptive Curriculum to Improve STAAR Outcomes

Amira Learning | Every Child Deserves the Chance to Become a Reader
5214F Diamond Heights Blvd, #3255, San Francisco, CA 94131
wwww.AmiraLearning.com | 866-883-7323 | info@amiralearning.com

Istation

Using Istation Math Computer-Adaptive Curriculum to Improve STAAR Outcomes

PREPARED BY
Matthew Jeans, PhD

DATE
June 2024

Executive Summary

Istation is an integrated learning system that provides assessments, supplemental curriculum, and detailed reports that can be used for progress monitoring or benchmarking. It provides a computer adaptive test for universal screening, and students are routed into the curriculum based on assessment performance.

Istation recommends that students use the supplemental curriculum 30–40 minutes per week to increase their math performance. Previous research with the Istation Math curriculum demonstrated that Istation usage increased math performance. This research evaluates if the Istation Math curriculum improves academic growth on the State of Texas Assessments of Academic Readiness (STAAR) Math assessment.

Using data from two Texas school districts in the 2022–23 school year, hierarchical linear models were used to account for clustering and control for SES at the school level. Usage was divided into quintiles, with quintile 1 indicating the lowest amount of usage and quintile 5 indicating the highest amount of usage. Students with no usage were also included in the analyses. Results indicated that Istation curriculum usage led to STAAR Math growth in fourth grade students:

- Students in usage quintile 4 scored **39 points higher** on the STAAR Math assessment than those in usage quintile 1.
- Students in usage quintile 5 scored **70 points higher** on the STAAR Math assessment than those in quintile 1 and 43 points higher than those without usage.

These findings underscore the pivotal role of Istation in enhancing students' math performance, as measured by the STAAR Math assessment.

Table of Contents

Introduction

Computer adaptive testing (CAT) has proven to be a transformative approach to pursuing educational equity, particularly in addressing literacy challenges in high-poverty schools. This study focuses on the Istation Math curriculum, a comprehensive computer-adaptive system designed to enhance math outcomes. Istation Math tailors instruction to individual student needs, potentially narrowing the performance gap in math as measured by standardized tests such as the STAAR assessment.

Istation Math is a comprehensive, computer-adaptive testing system that focuses on continuous progress monitoring in mathematics (Ketterlin-Geller, 2021). The assessment covers prekindergarten through 8th grade, and the curriculum is designed for students up to 5th grade. The first time the student takes the assessment in the school year, their results are used to place them in the curriculum.

This user-friendly platform offers engaging, age-appropriate interfaces and real-time data for teachers, aiding in identifying students struggling with mathematical concepts and tailoring instruction accordingly. Istation Math covers key mathematical domains such as number sense, operations, algebra, geometry, measurement, data analysis, and personal financial literacy. By providing detailed web-based reports, automatic alerts for students needing additional instruction, and access to a wide range of intervention materials, Istation Math effectively supports personalized learning and instructional decision-making, ensuring students progress toward achieving grade-level standards in mathematics.

Evidence for the efficacy of the Istation Math curriculum comes from research that demonstrates Istation usage led to increased achievement across several assessments:

- NWEA MAP (Jeans, 2024a; Jeans, 2024b)
- ACT Aspire (Patarapichayatham & Locke, 2020)
- Ohio AIR (Patarapichayatham & Locke, 2020)

Therefore, this study aims to evaluate the impact of Istation usage on STAAR Math outcomes of third and fourth grade students in a midsize urban Texas school district. Specifically, the study aims to address the following question:

- Does the Istation Math computer-adaptive curriculum affect STAAR Math outcomes relative to those not using the curriculum?
- Does Istation usage vary between schools?
- Are STAAR scores different based on Istation usage and socioeconomic status?

Methodology

Analytical Sample

The data are from students in 42 schools from two school districts in Texas from the 2022–2023 academic year. This study focused on fourth grade students (n=2258) with an Istation Math score at all three benchmarks. Of those that had demographic data (n=1794), The majority of students are Hispanic (51%), followed by White (32%), Black/African American (9%), Asian (5%), and other (3%). On average, 70% of students are eligible for the free- and reduced-price lunch program (FRL). Approximately 17% of students are disabled/special education (SPED) students, and 11% are English learners.

Measures

STAAR Math

STAAR Math is the state testing program for Texas students in grades 3 through 8. The Texas Education Agency (TEA), in collaboration with the Texas Higher Education Coordinating Board (THECB) and Texas educators, developed the STAAR program in response to requirements set forth by the 80th and 81st Texas legislatures. STAAR is an assessment program designed to measure how students have learned and can apply the knowledge and skills defined in the state-mandated curriculum standards (http://tea.texas.gov).

Istation Math

Istation Math is a computer-adaptive testing system designed for continuous progress monitoring in mathematics for prekindergarten through eighth grade students. It offers a user-friendly experience for teachers and students, with minimal administrative effort required from educators and engaging, developmentally appropriate interfaces for learners.

For younger students in prekindergarten to first grade, Istation Math employs interactive settings like "Mario's Market" to captivate and assist in identifying students who need additional support in mathematical concepts. In contrast, for students in grades 2 to 8, the assessment adopts a more traditional format with question stems and multiple-choice answers, effectively linked to various teaching resources and targeted intervention strategies.

The Istation Math Formative Assessment comprehensively covers essential mathematical domains, including number sense, operations, algebra, geometry, measurement, data analysis, and personal financial literacy, aligning with the National Council of Teachers of Mathematics (NCTM) standards. The assessment's computer-adaptive nature, powered by Item Response Theory (IRT), tailors the difficulty of questions based on each student's performance, ensuring a highly personalized assessment experience. This approach enhances the accuracy of measuring student abilities and provides real-time, easily interpretable web-based reports. These reports detail students' strengths and weaknesses, enabling teachers to make informed decisions for targeted instruction and intervention.

Curriculum Usage

Istation recommends that students at or below the 40th percentile of the normative sample on Istation Math use the curriculum for 40 minutes per week and that students who score above the 40th percentile use the curriculum for 30 minutes per week. For this study, usage quintiles were calculated by grade based on Istation Math

usage within the sample. Quintile 1 represents the lowest amount of usage, and quintile 5 represents the highest amount of usage.

Socioeconomic Status

Socioeconomic status at the school level was determined by the percentage of students eligible for the free or reduced-price school lunch (FRPL) program. Categorization was defined using the National Center for Education Statistics (NCES) criteria. NCES divides the percentages into quintiles:

- SES 1 consists of high-poverty schools with **≥75%** of students eligible for FRPL.
- SES 2 consists of mid-high poverty schools with **50–74.9%** of students eligible for FRPL.
- SES 3 consists of mid- to low-poverty schools with **25–49.9%** of students eligible for FRPL.
- SES 4 consists of low-poverty schools with **< 25%** of students eligible for FRPL.

Analytical Approach

Due to the sample's students being nested in schools, a hierarchical linear model (HLM) was used to examine the efficacy of using the Istation curriculum on STAAR Math assessment scores from the 2022-23 school year, controlling for the baseline Istation Math score and school-level SES.

Two-level HLM models control for the effects at the student level (Level 1) and the school level (Level 2). Four nested models were tested. Model 1 is the baseline model that consists of only the random effect for the intercept. Model 2 is an extension of model 1 that includes fixed effects at Level 1, which includes usage quintiles. Model 3 is an extension of model 2 that includes random slopes for Level 1 (weekly usage). Model 4 extends model 3 and includes the Level 2 fixed effects (SES).

Results

Table 1 shows the correlations between the Istation Math formative assessment and STAAR MATH to determine if there was a significant relationship. Correlation coefficients were 0.81 and 0.80 for MOY and EOY, respectively, indicating a strong relationship between the Istation Math formative assessment scores and STAAR MATH spring scores.

Table 1. *Correlations between Istation Math MOY and EOY scores and STAAR MATH Spring Scores*

Istation Math MOY & STAAR MATH	Istation Math EOY & STAAR MATH
0.79***	0.87***

*** $p < 0.001$

Table 2 shows the total minutes by usage quintiles. Generally, 72% of students in quintile 5 met the Istation usage recommendations, needing 1,080–1,440 minutes total for the school year.

**Table 2.** *Usage Quintiles and Total Minutes for the School Year*

Usage Quintile	Usage Percentile Rank	Total Minutes
1	≤20	≤70
2	21–40	71–278
3	41–60	279–507
4	61-80	508–891
5	>80	>891

Istation Usage on STAAR Math Outcomes

Figure 1 shows the graphical representation of increases in STAAR Math gain scores by total minutes of usage per school year for fourth grade students. Analyses compared STAAR Math scores to those with the lowest usage and those without usage.

Figure 1. *Differences in STAAR Math Gain Scores for Fourth Grade Students by Istation Total Usage*
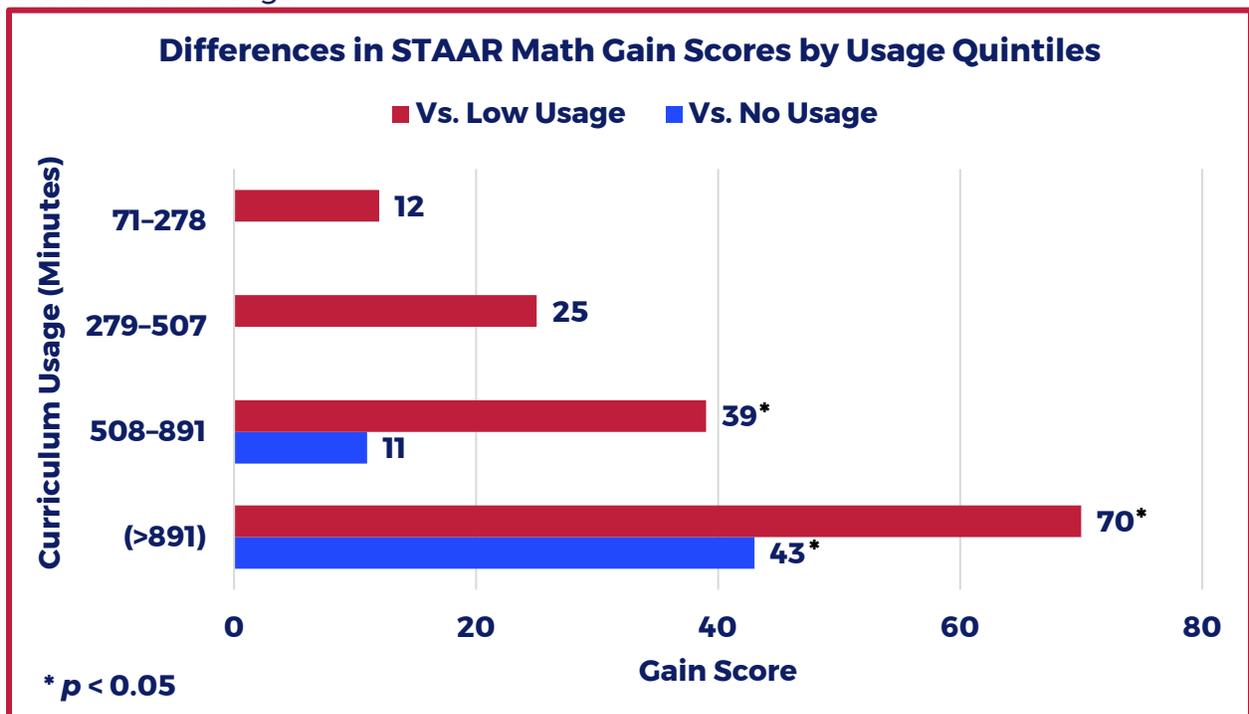
Note. Statistically insignificant negative coefficients are not presented in this figure.

Usage Results in Fourth Grade Students With Usage

Table 3 shows the results of the HLM models for fourth grade students, with low usage (quintile 1) as the referent group. Fourth grade students in the fourth Istation Math usage quintile (508–891 total minutes/school year) had an increase of 39 points in STAAR Math scores compared to students in the lowest usage quintile. In addition, students in quintile 5 (>891 total minutes/school year) had an increase of 70 points in STAAR Math scores compared to quintile 1. Twelve percent (12%) of the score variability was due to schools, leaving 88% due to students. While STAAR scores increased as school SES increased, these results were statistically insignificant,

suggesting that the gains observed in the high usage groups could be lowering the gap in academic performance between low- and high-poverty schools. The significance of the error variance suggests that schools influence the variability in students' scores after accounting for usage and SES. There was also variability in Istation curriculum usage across schools.

Table 3. *Two-Level HLM for Fourth Grade, Coefficients and Standard Errors (SE)*

Fixed Effects	Model 1	Model 2	Model 3	Model 4
Intercept	1569.13* (13.24)	-389.29* (56.31)	-381.97* (55.98)	-375.51* (56.50)
Usage 2 (21-40)		12.18 (12.50)	10.30 (12.45)	12.39 (12.82)
Usage 3 (41-60)		27.21* (13.60)	22.60 (14.06)	25.27 (14.71)
Usage 4 (61-80)		37.76* (13.91)	35.99* (15.28)	38.72* (16.08)
Usage 5 (>80)		58.33* (14.24)	67.98* (19.60)	69.90* (20.05)
Baseline Score		3.80* (0.11)	3.80* (0.11)	3.79* (0.11)
SES 2				-20.58 (19.14)
SES 3				8.66 (22.52)
SES 4				9.76 (112.89)
Error Variance				
Level-1	23368.99* (1029.73)	10695.82* (471.26)	10344.58* (463.27)	10348.30* (464.68)
Level-2 Intercept	3250.42* (1418.65)	857.51* (401.68)	878.62* (486.73)	966.67* (540.81)
Weekly Usage			3.29* (2.24)	3.13* (2.32)
Model Fit				
AIC	13723.2	12867.4	12854.1	12831.4
BIC	13738.1	12907.1	12898.8	12891.0

* $p < 0.05$; ICC = .12
Values based on Stata 18.5 Mixed. Entries show parameter estimates with standard errors in parentheses. Estimation Method = REML; Satterthwaite degrees of freedom.

Usage Results in Fourth Grade Students Without Usage

Table 4 shows the results of the HLM models for fourth grade students, with no usage as the referent group. Fourth grade students in the fifth Istation Math usage quintile (>891 total minutes/school year) had an increase of 43 points in STAAR Math scores compared to students with no usage. Thirteen percent (13%) of the score variability was due to schools, leaving 87% due to students. Looking at school-level SES, those in

low-poverty schools STAAR Math scores approximately 32 points higher than their high-poverty school counterparts. No significant difference was observed between school SES when only examining students with usage, but there is when including students with no curriculum usage. This further supports the notion that usage can lower the performance gap observed between low- and high-poverty schools. The significance of the error variance suggests that schools influence the variability in students' scores after accounting for usage and SES. There was also variability in Istation curriculum usage across schools.

Table 4. . *Two-Level HLM for Fourth Grade Students With and Without Usage, Coefficients and Standard Errors (SE)*

Fixed Effects	Model 1	Model 2	Model 3	Model 4
Intercept	1570.44 (9.91)	-463.50* (40.28)	-461.03* (40.19)	-461.25* (40.50)
Usage 1 (≤20)		-19.19 (10.18)	-16.93 (10.16)	-16.24 (10.21)
Usage 2 (21-40)		-11.00 (11.53)	-10.30 (11.66)	-10.52 (11.76)
Usage 3 (41-60)		2.35 (12.14)	-0.01 (12.80)	-1.27 (13.03)
Usage 4 (61-80)		12.61 (12.34)	13.15 (14.08)	11.31 (14.45)
Usage 5 (>80)		32.46* (12.63)	44.83* (18.84)	43.40* (19.27)
Baseline Score		4.01* (0.08)	4.00* (0.08)	3.99* (0.08)
SES 2				1.20 (13.35)
SES 3				18.07 (16.40)
SES 4				32.26* (113.85)
Error Variance				
Level-1	22687.40* (681.77)	10469.59* (314.91)	10300.59* (311.70)	10300.46* (311.72)
Level-2 Intercept	3487.16* (926.38)	1016.80* (288.78)	1038.46* (306.45)	1065.49* (322.76)
Weekly Usage			3.48* (2.31)	3.82* (2.56)
Model Fit				
AIC	29142.1	27358.7	27344.7	27323.7
BIC	29159.3	27410.2	27401.9	27398.1

* $p < 0.05$; ICC = .13
Values based on Stata 18.5 Mixed. Entries show parameter estimates with standard errors in parentheses. Estimation Method = REML; Satterthwaite degrees of freedom.

Conclusion

The findings of this study underscore the potential of the Istation Math computer-adaptive curriculum in enhancing students' performance on the STAAR Math assessment. The analysis reveals that increased usage of the Istation Math program

correlates with higher STAAR Math scores among fourth-grade students. Notably, students in the highest usage quintile (quintile 5) demonstrated a significant improvement, scoring 70 points higher than those in the lowest usage quintile (quintile 1) and 43 points higher than those without usage.

One notable observation is the presence of negative coefficients for the first three quintiles when compared to no usage, despite these findings being statistically insignificant. This could be attributed to a higher concentration of lower-performing students in these quintiles (+6%). Typically, we expect students with lower baseline performance to engage more with the curriculum, necessitating a closer examination of implementation fidelity. This suggests that the intended usage patterns were not fully adhered to, and students who needed the most intervention did not use the program as much as recommended. Thus, ensuring that students who require more assistance engage adequately with the curriculum is essential for maximizing its effectiveness.

Furthermore, the data indicates that the positive impact of Istation Math is more pronounced in high-poverty schools. This suggests that the adaptive nature of the curriculum is particularly beneficial for students in these settings, helping to bridge the performance gap between low- and high-poverty schools. While the study did not find a statistically significant difference in STAAR Math scores based on SES compared to students with no usage, the gains observed in low-poverty schools, including those without usage, imply that consistent engagement with the curriculum can mitigate some disadvantages associated with lower socioeconomic status.

These results advocate for the broader implementation of adaptive learning technologies like Istation Math, especially in under-resourced schools. By providing personalized learning experiences tailored to individual student needs, such technologies can foster academic growth and contribute to educational equity. Future research should focus on strategies to enhance implementation fidelity, ensuring that students who need the most support are utilizing the curriculum effectively. Additionally, exploring the long-term impacts of sustained engagement

with adaptive learning programs on student outcomes would provide valuable insights for educators and policymakers.

In conclusion, this study highlights the efficacy of the Istation Math computer-adaptive curriculum in improving STAAR Math performance. The findings emphasize the importance of consistent and appropriate program usage to achieve substantial academic improvements. Istation Math can play a crucial role in enhancing math proficiency and reducing performance disparities across different socioeconomic backgrounds by addressing specific educational needs and supporting personalized learning paths.

References

Jeans, M. (2024a). *Using Istation Math to Improve Student Outcomes on the NWEA MAP Math Assessment*. Istation.

Jeans, M. (2024b). *Using Istation Math to Improve NWEA MAP Math Outcomes in At-Risk Students*. Istation.

Ketterlin-Geller, L. (2021). *Istation's Indicators of Progress (ISIP) Math Technical Report*. Istation.

Patarapichayatham, C. & Locke, V. (2020). *Linking the ACT Aspire Assessments to ISIP Reading and Math*. Istation.
https://www.istation.com/Content/downloads/studies/ACT_Aspire.pdf

Patarapichayatham, C. & Locke, V. (2020). *Linking the Ohio AIR to ISIP*. Istation.
https://www.istation.com/Content/downloads/studies/Ohio_AIR_Linking_Study.pdf