AMIRA
LEARNING

Using Istation Math to Improve NWEA MAP Math Outcomes in At-Risk Students

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

Amira Learning merged with Istation on June 11, 2024. Amira Learning is the the go-forward business entity. Read more here.

Istation

Matthew Jeans, PhD

Using Istation Math to Improve NWEA MAP Math Outcomes in At-Risk Students

Key Findings

- Level 1 students, the lowest performers, exhibited the most significant improvement in NWEA MAP Math scores with the highest usage (quintile 5) of Istation.
- Level 2 students consistently improved their MAP Math scores across a broader range of Istation usage levels, notably in usage quintiles 3 to 5.
- The study demonstrates the differential impact of Istation Math based on initial student performance levels, with more intensive usage yielding greater benefits for lower-performing students.
- These findings suggest that adaptive, technology-based learning platforms like Istation are particularly effective in supporting students with greater educational needs.

Overview

In the wake of the COVID-19 pandemic, mathematics education has faced significant upheaval, with at-risk students experiencing some of the most pronounced educational disparities. The pandemic's disruption of traditional educational models has led to notable declines in student achievement in mathematics, exacerbating existing challenges for students already facing academic underperformance (Kuhfeld et al., 2022). This situation calls for innovative educational strategies that effectively support and enhance learning outcomes for these vulnerable student populations.

Digital learning platforms have risen to this challenge, offering a beacon of hope for at-risk students. Platforms like Istation Math provide adaptive, engaging, and personalized learning experiences crucial for students requiring additional academic support. Istation Math's comprehensive approach to monitoring and assessing student progress in mathematics is particularly beneficial in tailoring instruction to the specific needs of at-risk students, potentially bridging the achievement gap exacerbated by the pandemic.

Furthermore, studies have indicated that while there has been a general decline in mathematics achievement during the pandemic, certain digital learning environments have shown promise in preventing educational losses. For instance, Spitzer and Musslick (2020) observed that online learning environments could narrow the performance gap between low- and high-achieving students.

Previous research has shown the Istation Math Formative Assessment to be correlated with the Ohio AIR, ACT Aspire, and NWEA MAP Math assessments (Patarapichayatham & Locke, 2020a; Patarapichayatham & Locke, 2020b; Jeans, 2024).

Therefore, this study aims to investigate the efficacy of Istation usage on NWEA MAP Math outcomes of at-risk students in a large urban Texas school district. This research focuses on low-performing students, examining how Istation Math impacts their mathematical competencies and contributes to closing the achievement gap.

Core Question: Does the usage of Istation significantly improve NWEA MAP Math scores among at-risk students

Methodology

Measures

NWEA MAP Math

The NWEA MAP Math assessment is a computer-adaptive test designed to measure student achievement in mathematics from kindergarten through grade 12. It aligns with the Common Core State Standards (CCSS) and is structured to adapt to each student's learning level. This study specifically examines the impact of Istation Math on first through third grade students, with NWEA MAP Math assessment gain scores as the primary outcome to measure the effectiveness of Istation.

Istation Math

The Istation Math Formative Assessment is a computer-adaptive testing system designed for continuous progress monitoring in mathematics for prekindergarten through 8th grade (Ketterlin-Geller, 2021). It offers a user-friendly experience for teachers and students, with minimal administrative effort required from educators and engaging, developmentally appropriate interfaces for learners.

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.

Additionally, Istation Math includes reporting features that automatically alert teachers to students requiring additional instructional support and offers access to a comprehensive library of instructional materials and lessons. This feature aids in customizing teaching strategies to meet individual student needs, which allows for a more accurate profile of each student's abilities while facilitating enhanced teacher planning and student learning outcomes.

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 usage.

Istation Instructional Levels

Once a student completes the Istation Math assessment at the BOY benchmark, the score is linked to an instructional level set to identify students at risk for developing mathematics deficiencies. These instructional levels are as follows:

- **Level 1:** At or below the 20th percentile
- **Level 2:** At or above the 21st percentile but below the 41st percentile
- **Level 3:** At or above the 41st percentile but below the 61st percentile
- **Level 4:** At or above the 61st percentile but below the 81st percentile
- **Level 5:** At or above the 81st percentile

Students classified in Level 1 and Level 2 are considered "at-risk" and require educational intervention.

Analytical Sample

The data are from students in a large urban school district in Texas. This study focused on first through third grade Level 1 and Level 2 students (n=836). Of those that had demographic data (n=546), the largest racial/ethnic group was Hispanic (40.1%), followed by White (29.5%), Black/African American (16.7%), two or more races (7.9%), Asian (5.3%), and American Indian/Alaska Native (< 1%). Table 1 presents the sample size by Istation Math BOY level and grade.

Table 1. *Sample size by Istation Math Level and Grade*

Grade	Level 1	Level 2
1	140	112
2	124	170
3	126	164

Analytical Approach

Due to the sample having students nested in schools, a hierarchical linear model (HLM) was used to examine the efficacy of Istation usage on NWEA MAP Math assessment gain scores, which were calculated as the difference between beginning-of-year (BOY) and end-of-year (EOY) scores. However, the intraclass correlations for the models were low, suggesting there was little variance in NWEA MAP Math scores attributed to the school level. Therefore, linear regression models were employed. All models controlled for BOY NWEA MAP Math scores.

Results

Table 2 shows the total minutes by quintiles and grades.

Table 2. *Usage Quintiles and Total Time (Minutes) across School Year by Grade*

Usage Quintile	Usage Percentile Rank	1st Grade	2nd Grade	3rd Grade
1	≤20	≤521	≤638	≤615
2	21–40	522–808	639–861	616–830
3	41–60	809–1128	862–1070	831–1097
4	61–80	1129–1541	1071–1449	1098–1461
5	>80	>1541	>1449	>1461

Tables 3 through 5 present the regression results for first through third grade students. In addition, Figures 1 and 2 are graphical representations of increases in NWEA MAP Math gain scores by total quintiles of usage per school year.

Figure 1. *Differences in NWEA MAP Math Gain Scores for First through Third Grade Level 1 Students by Istation Total Usage*

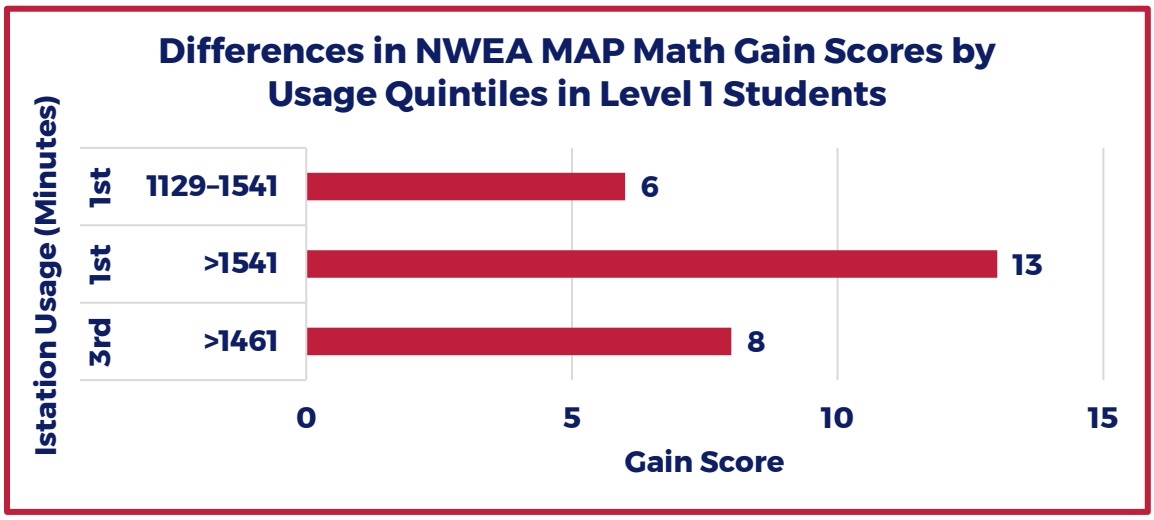
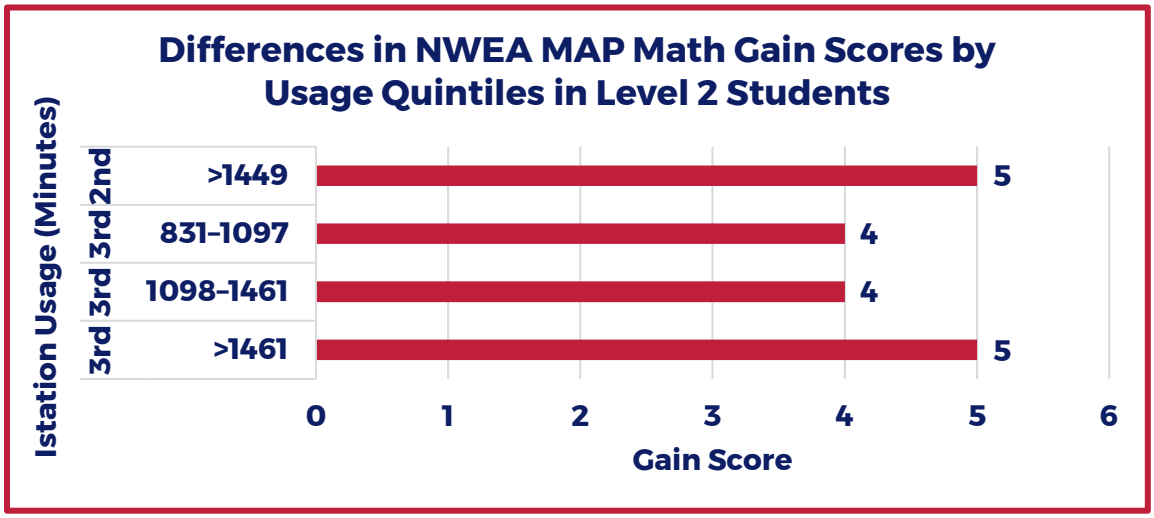


Figure 2. *Differences in NWEA MAP Math Gain Scores for First through Third Grade Level 2 Students by Istation Total Usage*



First Grade

Table 3 shows the results for Level 1 and Level 2 first grade students. Level 1 students in the fourth and fifth Istation Math usage quintiles (≥1129 total minutes/school year) had an increase of 6–13 points in NWEA MAP Math scores compared to students in the lowest usage quintile, the referent group.

Table 3. *NWEA MAP Math Regression Model for Level 1 and Level 2 First Grade Students, Coefficients and Standard Errors (SE)*

Fixed Effects	Level 1	Level 2
Intercept	44.83* (11.38)	49.27* (0.10)
Baseline Score	-0.23* (0.08)	-0.20* (0.10)
Usage 2 (21-40)	4.00 (2.35)	-2.80 (2.33)
Usage 3 (41-60)	4.22 (2.29)	-2.37 (2.38)
Usage 4 (61-80)	5.92* (2.30)	0.56 (2.47)
Usage 5 (>80)	12.67* (2.66)	0.64 (2.26)

Second Grade

Table 4 shows the results for Level 1 and Level 2 second grade students. Level 2 students in the fifth Istation Math usage quintile (>1449 total minutes/school year) had an increase of 5 points in NWEA MAP Math scores compared to students in the lowest usage quintile.

Table 4. *NWEA MAP Math Regression Model for Level 1 and Level 2 Second Grade Students, Coefficients and Standard Errors (SE)*

Fixed Effects	Level 1	Level 2
Intercept	39.06* (12.52)	74.28* (10.67)
Baseline Score	-0.15 (0.08)	-0.35* (0.06)
Usage 2 (21-40)	-0.03 (2.41)	0.43 (1.78)
Usage 3 (41-60)	2.26 (2.49)	0.39 (1.74)
Usage 4 (61-80)	-3.43 (2.88)	0.94 (1.69)
Usage 5 (>80)	0.15 (3.21)	4.67* (1.66)

Third Grade

Table 5 shows the results for Level 1 and Level 2 third grade students. Level 1 students in the fifth Istation Math usage quintile (>1461 total minutes/school year) had an increase of 8 points in NWEA MAP Math scores compared to students in the lowest usage quintile. Level 2 students in the third through fifth usage quintiles (≥831 total minutes/school year) had an increase of 4–5 points in NWEA MAP Math scores compared to the lowest usage quintile.

Table 5. *NWEA MAP Math Regression Model for Level 1 and Level 2 Third Grade Students, Coefficients and Standard Errors (SE)*

Fixed Effects	Level 1	Level 2
Intercept	46.58* (12.56)	31.08* (10.41)
Baseline Score	-0.20* (0.07)	-0.11 (0.06)
Usage 2 (21-40)	-0.39 (2.32)	2.95 (1.72)

Usage 3 (41-60)	1.83 (2.35)	4.00* (1.75)
Usage 4 (61-80)	1.63 (2.41)	4.10* (1.77)
Usage 5 (>80)	8.03* (2.63)	5.43* (1.72)

Discussion

This study's findings underscore the efficacy of Istation Math usage in improving NWEA MAP Math scores among at-risk students (Level 1 and Level 2). The differentiated impact based on student levels and usage intensity highlights the importance of personalized educational interventions.

For Level 1 students, who represent the lowest performing group, the results indicate a pronounced benefit from high usage (often in quintile 5) of Istation Math. This observation aligns with the premise that students with the most significant academic challenges benefit more from extended engagement with educational interventions. The substantial improvements in NWEA MAP Math scores for these students suggest that intensive, adaptive platforms like Istation can be instrumental in closing the achievement gap for the most at-risk student populations.

In contrast, Level 2 students, who perform marginally above Level 1 students, show improvements across a broader range of usage quintiles (3–5). This pattern may indicate that while these students also benefit from Istation, their needs are met with a slightly less intensive engagement compared to Level 1 students. This finding is crucial for educators and policymakers in allocating resources and designing intervention strategies sensitive to different student groups' varying needs.

The study's implications extend beyond the immediate context of the NWEA MAP Math assessments. The results contribute to a growing body of evidence supporting the use of adaptive, technology-based learning platforms as effective tools in addressing educational disparities. In the aftermath of the COVID-19 pandemic, which exacerbated challenges in education, solutions like Istation provide a viable pathway to support at-risk students.

Overall, the study highlights the critical role of targeted, usage-intensive educational interventions in supporting the academic development of at-risk students. It emphasizes the need for educational strategies that are both adaptive to student performance levels and flexible in terms of usage intensity to effectively address the diverse needs of students facing academic underperformance.

Conclusion

The study reaffirms the significant impact of Istation on improving NWEA MAP Math scores for Level 1 and Level 2 students in a large urban Texas school district. It demonstrates that intensive, tailored usage of educational technology can effectively support at-risk students, with more pronounced benefits for the lowest performers (Level 1). These findings underscore the potential of adaptive learning platforms to address educational disparities, emphasizing the need for strategies responsive to diverse student needs and learning patterns. This research contributes to understanding how technology-based interventions can be optimally utilized in educational settings, particularly for students who require the most support.

References

Jeans, M. (2024). Linking NWEA MAP Math to Istation Math. Istation.

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

Kuhfeld, M., Soland, J., & Lewis, K. (2022). Test Score Patterns Across Three COVID-19-Impacted School Years. *Educational Researcher, 51*, 500–506. https://doi.org/10.3102/0013189X221109178.

Patarapichayatham, C. & Locke, V. (2020a). Linking the ACT Aspire Assessments to ISIP Reading and Math. Istation.

Patarapichayatham, C. & Locke, V. (2020b). Linking the Ohio AIR to ISIP. Istation.

Spitzer, M., & Musslick, S. (2020). Academic performance of K-12 students in an online-learning environment for mathematics increased during the shutdown of schools in wake of the COVID-19 pandemic. *PLoS ONE, 16*. https://doi.org/10.1371/journal.pone.0255629.