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Meeting Istation Curriculum Usage Recommendations Increases Reading Growth

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Istation

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Key Findings

- Students in Idaho using Istation Reading demonstrated higher reading scores compared to their national counterparts in kindergarten through third grade.

- The study supports an optimal curriculum usage range of 20–40 minutes per week for the Istation curriculum. Students adhering to this recommendation had the most significant reading score and percentile gains.

- Students in lower performance tiers benefitted significantly from meeting the usage recommendations.

- Idaho students achieved *Above Typical* and *Accelerated* growth rates more frequently than the national sample. Meeting the usage recommendation increased the probability of achieving higher reading growth.

Overview

Istation is a digital instructional intervention tool for various content areas aimed at pre-K through eighth grade learners. The reading program includes a formative assessment named Istation Reading, which is a computer-adaptive test (CAT) and diagnostic literacy assessment designed to track student growth over time. Istation Reading also includes an adaptive, online curriculum, which generates personalized student data profiles that teachers can use to make data-driven instructional decisions and assign custom learning interventions. Istation curriculum serves as supplemental instruction to standardized testing and has been shown to increase standardized ELA assessment scores (Cook & Ross, 2022), reading achievement scores (Campbell et al., 2022; Campbell et al., 2021), English literacy (Locke et al., 2022), and reading and academic growth (Campbell et al., 2021; Patarapichayatham & Locke, 2020; Idaho Department of Education, 2020) in students from schools that implemented Istation curriculum compared to students without access to the curriculum component.

The current study examined Istation score and percentile gains in relation to meeting the Istation curriculum usage recommendations. The study employed a quasi-experimental design to examine the following questions:

Core Question: What is the effect of meeting the Istation curriculum usage recommendation on students' performance as measured on the Istation Reading Formative Assessment? Does it vary:
1. for students by grade (K-3)?
2. by performance tier?
3. by exceeding or not meeting the recommendation?
4. between Idaho students and others in the country?

Methodology

Analytical Sample

Participants in this evaluation included kindergarten through third grade students (n=93,233) in Idaho schools, of which a subset implemented the Istation curriculum for the 2022-2023 school year (n=50,867). For those who had demographic data, the majority of students are White (67%), followed by Hispanic (28%) and multi-racial (2%). Approximately 12% were economically disadvantaged, and 17% were in special education. Students included in the current study had one set of non-missing overall Istation Reading Beginning-of-Year (BOY) scores as determined by the lowest score recorded in August, September, or October, and the End-of-Year (EOY) scores were

the highest from March, April, and May. This approach maximized the sample size and accommodated variations in test-taking schedules across different schools and districts, capturing a broader spectrum of student performance through the academic year.

Analytical Strategy

The first part of the analysis involved comparing the BOY-to-EOY growth in reading scores and percentiles between the Idaho cohort and the national sample, excluding Idaho students. An analysis of covariance (ANCOVA) was used, controlling for initial BOY scores and percentiles, to adjust for baseline differences. The outcome measures included adjusted means of score gains and percentile gains for each group.

The impact of supplemental curriculum usage patterns on reading gains was analyzed through an ANCOVA, segmenting the sample into four usage groups based on weekly exposure: (1) None, no usage; (2) Below, <20 minutes; (3) Met, 20–40 minutes, and (4) Above, >40 minutes. Analysis showed a curvilinear relationship between the duration of curriculum usage and reading gains, with the 20-40 minutes of usage per week being identified as optimal. This optimal range was determined because it represents a balance where sufficient exposure to the curriculum enhances learning without causing fatigue or disengagement, which might occur with longer durations. These models controlled for initial BOY scores and percentiles, and a Bonferroni correction was applied to adjust for multiple comparisons.

Further analysis segmented the data by performance tiers at BOY, defined by percentile ranks: Tier 1 (≤20th percentile), Tier 2 (21st–40th percentile), and Tier 3 (>40th percentile). This stratification was used to assess how curriculum usage influenced growth within different proficiency levels.

Istation growth pathways, normed pathways that provide a metric accounting for differing growth patterns, are categorized into four levels: (1) below typical, (2) typical, (3) above typical, and (4) accelerated, based on BOY percentiles and relative BOY-to-EOY gain scores. These categories were used to assess the proportion of students in each growth level between Idaho and the national sample, employing a z-test for two proportions to analyze the differences.

Lastly, a mixed-effects ordinal logistic regression (MEOLR) was conducted to examine the influence of curriculum usage patterns (i.e., Below, Met, Above) on students' performance, categorized by the growth pathways. The analysis included a progression of models, starting with a base model and adding complexity through

fixed effects and random slopes for usage duration. The effect of school SES was considered but ultimately excluded due to insignificant model improvement.

Results

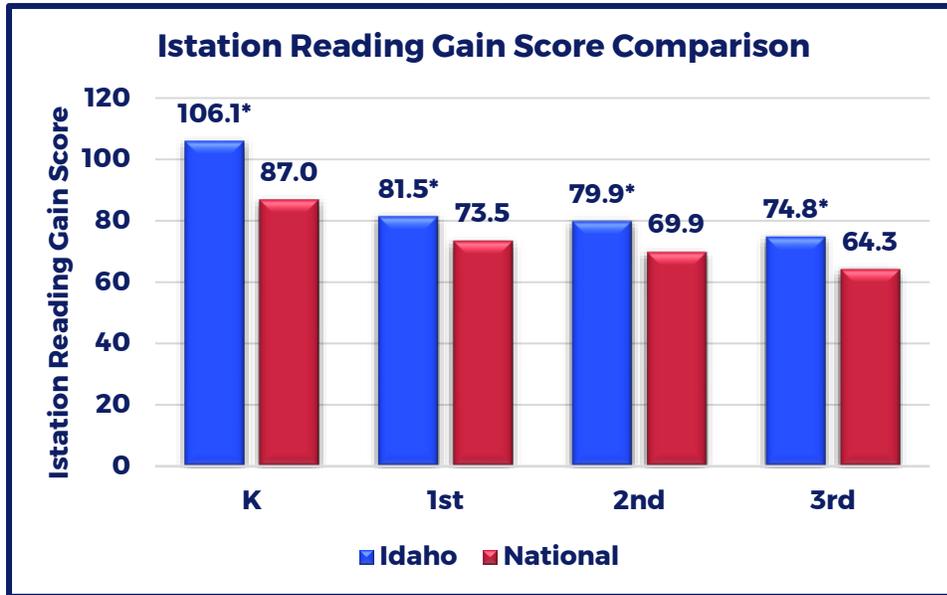## Istation Reading Gains and National Comparison

Table 1 shows the BOY and EOY Istation Reading overall scores between Idaho and the national sample by grade level. Idaho students had higher BOY and EOY scores across all grade levels, on average, compared to their peers in the rest of the country. The largest difference observed was in third grade students, with those in Idaho having BOY and EOY scores approximately 22 and 34 points higher, respectively, compared to their counterparts.

Table 1. *Istation Reading BOY and EOY Overall Score Comparison Between Idaho and the National Sample by Grade Level, Mean and Standard Deviation (SD)*

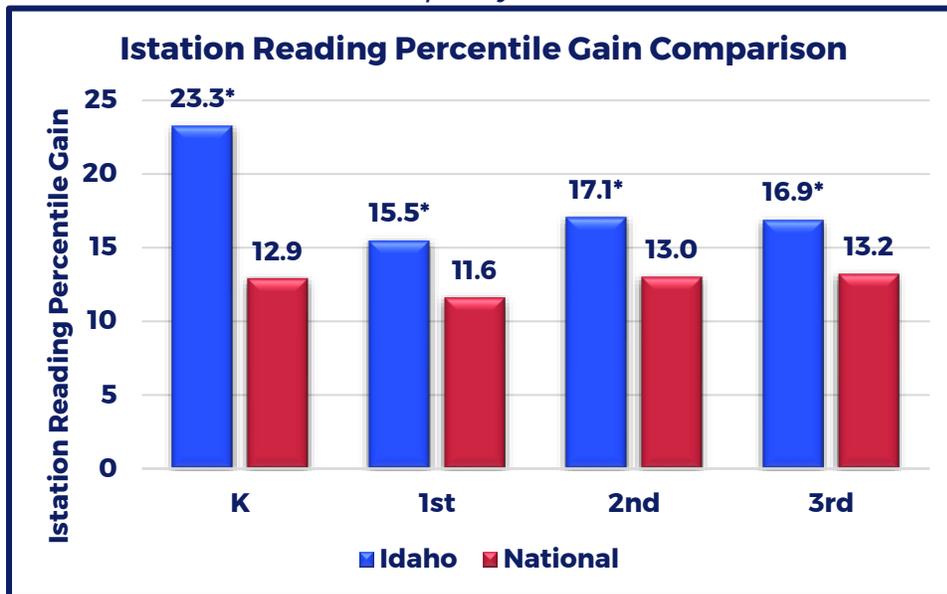| Grade	BOY Reading Score		EOY Reading Score	
	Idaho	National	Idaho	National
Kindergarten	246.98 (46.60)	240.95 (49.11)	351.96 (51.56)	328.20 (56.55)
Sample Size	21719	110213	21719	110213
1st	320.30 (51.56)	306.25 (54.96)	401.45 (57.89)	379.84 (65.85)
Sample Size	23433	127771	23433	127771
2nd	388.73 (63.05)	369.35 (71.38)	468.42 (74.58)	439.28 (82.18)
Sample Size	23946	134921	23946	134921
3rd	442.40 (67.81)	419.55 (76.04)	517.59 (83.65)	483.77 (88.45)
Sample Size	24135	132512	24135	132512

Figures 1 and 2 represent Istation Reading BOY-to-EOY gain score and percentile comparisons by grade level between Idaho and the national sample. Controlling for baseline scores, Idaho had significantly higher gain scores and percentile gains compared to the national sample across all grade levels. The largest gains observed for overall score and percentile were in kindergarten students. Of the students included in these analyses, **99.0% had positive score growth**, and **86.2% had positive percentile growth**. Students achieved an **average score growth of 17.2% to 42.5%**, and an **average percentile growth of 33.3% to 56.4%**, over the course of the school year.

Figure 1. *Istation Reading BOY-to-EOY Overall Gain Score Comparison Between Idaho and the National Sample by Grade Level*

Istation Reading Gain Score Comparison

Bar chart — "Istation Reading Gain Score" (y-axis, 0–120) by grade level (K, 1st, 2nd, 3rd) comparing Idaho (blue) and National (red):

- K: Idaho 106.1*, National 87.0
- 1st: Idaho 81.5*, National 73.5
- 2nd: Idaho 79.9*, National 69.9
- 3rd: Idaho 74.8*, National 64.3

* $p < 0.001$. Adjusted means are shown.

Figure 2. *Istation Reading BOY-to-EOY Overall Percentile Gain Comparison Between Idaho and the National Sample by Grade Level*

Istation Reading Percentile Gain Comparison

Bar chart — "Istation Reading Percentile Gain" (y-axis, 0–25) by grade level (K, 1st, 2nd, 3rd) comparing Idaho (blue) and National (red):

- K: Idaho 23.3*, National 12.9
- 1st: Idaho 15.5*, National 11.6
- 2nd: Idaho 17.1*, National 13.0
- 3rd: Idaho 16.9*, National 13.2

* $p < 0.001$. Adjusted means are shown.

Istation Reading Gains and Usage Recommendation Comparison

The Idaho sample was stratified into four usage groups based on weekly exposure to the supplemental curriculum: (1) None, no usage; (2) Below, <20 minutes; (3) Met, 20–40 minutes, and (4) Above, >40 minutes. Tables 2 and 3 show the Istation Reading overall score and percentile gains between the usage groups by grade level.

For Istation Reading scores, students meeting the supplemental curriculum recommendation consistently outgained students below the recommendation and not using the curriculum across all grade levels. While third grade students meeting the recommendation outgained those exceeding the recommendation, this difference was not statistically significant. Those exceeding the recommendation in grades K-2 also outgained students below the recommendation and not using the curriculum. There were no significant differences in gained between those meeting and exceeding the usage recommendation.

Table 2. *Istation Reading BOY-to-EOY Overall Gain Score Comparison Between Usage Groups by Grade Level, Adjusted Mean and Standard Error (SE)*

Grade	None	Below	Met	Above
K	103.52 (0.38)	102.69 (0.43)	111.81*+ (0.71)	114.15*+ (1.00)
1st	79.40 (0.32)	80.49 (0.38)	85.22*+ (0.56)	86.02*+ (0.75)
2nd	77.56 (0.36)	80.88* (0.41)	81.44*+ (0.68)	85.95*+ (1.10)
3rd	73.88 (0.40)	75.68* (0.43)	78.29*+ (0.79)	76.96 (1.50)

*Significant difference compared to None ($p < 0.05$).
+Significant difference compared to Below ($p < 0.05$).

Similarly, when examining percentile gains, students meeting the supplemental curriculum recommendation consistently outgained students below the recommendation and not using the curriculum across all grade levels. The only exception was that second grade students' percentile gains did not significantly differ between those meeting and those below the recommendation. Furthermore, second grade students exceeding the recommendation had significantly higher percentile gains, on average, than all other usage groups. However, those exceeding the recommendation in all other grade levels did not significantly outgain those meeting the recommendation, but they outgained those below the recommendation and those not using the curriculum.

Table 3. *Istation Reading BOY-to-EOY Percentile Gain Comparison Between Usage Groups by Grade Level, Adjusted Mean and Standard Error (SE)*

Grade	None	Below	Met	Above
K	21.58 (0.21)	21.11 (0.24)	26.64*+ (0.40)	28.04*+ (0.56)
1st	13.49 (0.16)	14.35* (0.19)	16.84*+ (0.27)	17.22*+ (0.36)
2nd	15.98 (0.15)	16.91* (0.16)	17.27* (0.27)	18.78*+^ (0.44)
3rd	15.75 (0.13)	16.29* (0.15)	17.44*+ (0.27)	16.30 (0.51)

*Significant difference compared to None ($p < 0.05$)
+Significant difference compared to Below ($p < 0.05$)
^Significant difference compared to Met ($p < 0.05$)

Istation Reading Gains and Usage Recommendation Tier Comparison

Idaho students were stratified by performance tiers at BOY, defined by percentile ranks: Tier 1 (≤20th percentile), Tier 2 (21st–40th percentile), and Tier 3 (>40th percentile). Students in Tiers 1 and 2 need educational intervention. Tables 4 and 5 show the Istation Reading overall score and percentile gains between the usage groups by tier.

Overall, trends in gain scores between usage groups did not vary by tier. Across all tiers, students who met or exceeded the usage recommendation significantly outgained those below the recommendation or not using the supplemental curriculum. In Tier 3 students, those below the usage recommendation still outgained those not using the supplemental curriculum.

Table 4. *Istation Reading BOY-to-EOY Overall Gain Score Comparison Between Usage Groups by Tier, Adjusted Mean and Standard Error (SE)*

Tier	None	Below	Met	Above
1 (n=27903)	86.62 (0.41)	85.61 (0.39)	93.02*+ (0.72)	92.80*+ (1.07)
2 (n=19656)	84.06 (0.36)	84.98 (0.39)	87.08*+ (0.64)	88.72*+ (0.99)
3 (n=45674)	80.85 (0.24)	84.50* (0.31)	86.18*+ (0.49)	88.37*+ (0.74)

*Significant difference compared to None ($p < 0.05$)
+Significant difference compared to Below ($p < 0.05$)

Similarly, trends in percentile gains between usage groups did not vary by tier. Across all tiers, students who met or exceeded the usage recommendation significantly outgained those below the recommendation or not using the supplemental curriculum. In Tier 3 students, those below the usage recommendation still outgained those not using the supplemental curriculum. In Tier 1 students, those not using the supplemental curriculum had a slightly higher percentile gain than those below the usage recommendation.

Table 5. *Istation Reading BOY-to-EOY Percentile Gain Comparison Between Usage Groups by Tier, Adjusted Mean and Standard Error (SE)*

Tier	None	Below	Met	Above
1 (n=27903)	19.94[+] (0.19)	19.10 (0.18)	23.08[*+] (0.33)	24.13[*+] (0.50)
2 (n=19656)	24.31 (0.21)	24.84 (0.22)	26.61[*+] (0.37)	28.05[*+] (0.57)
3 (n=45674)	11.27 (0.09)	12.93[*] (0.12)	14.01[*+] (0.18)	14.13[*+] (0.27)

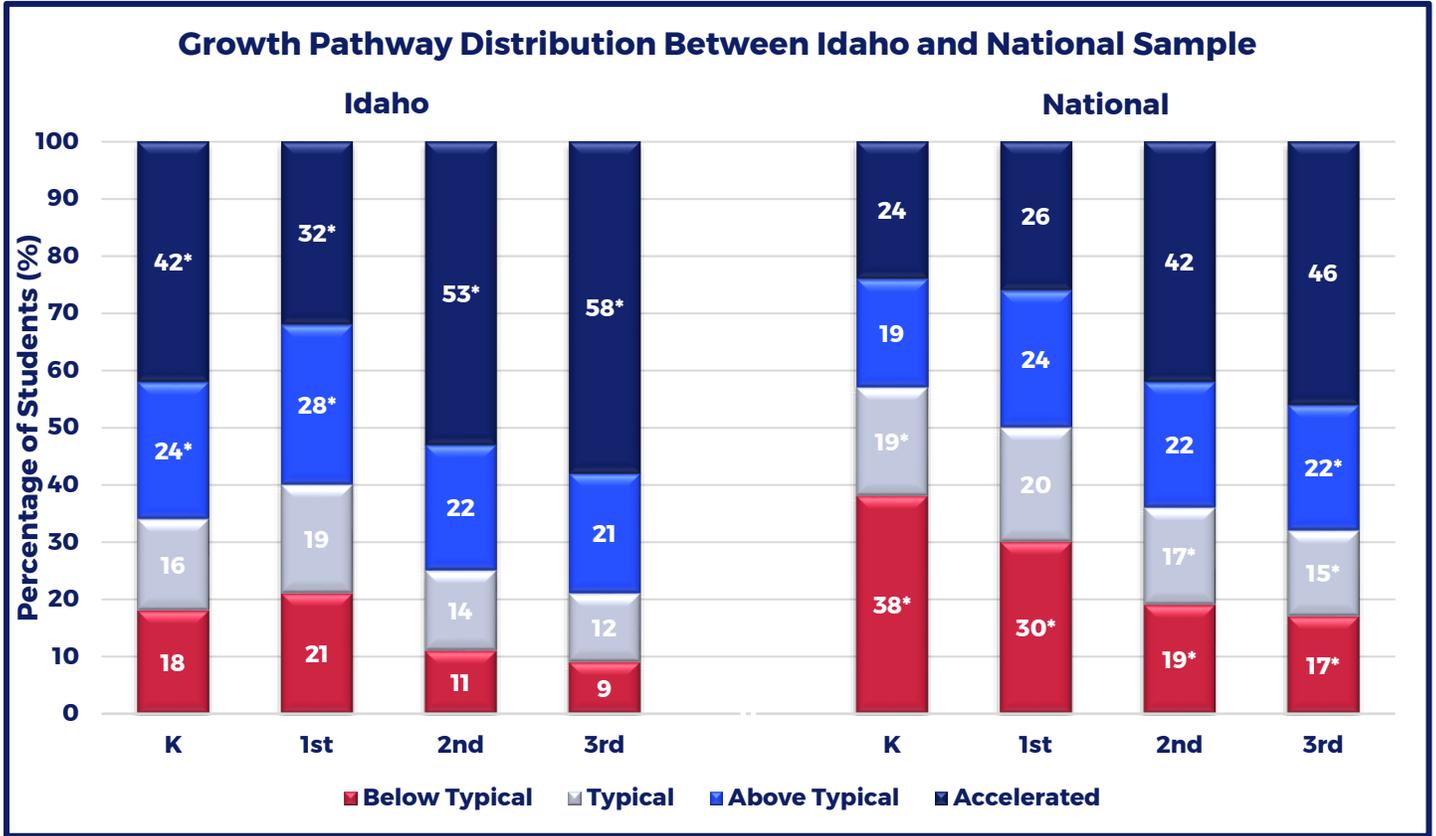*Significant difference compared to None ($p < 0.05$)
[+]Significant difference compared to Below ($p < 0.05$)

Istation Reading Growth and National Comparison

Students were stratified by Istation growth pathways, which are categorized into four levels: (1) below typical, (2) typical, (3) above typical, and (4) accelerated. These pathways are determined by BOY percentiles and associated BOY-to-EOY gain scores. Figure 3 represents the proportions of students in Idaho and the national sample by grade level.

The national sample had significantly more students in the *Below Typical* and *Typical* growth pathways across all grade levels compared to Idaho students. The one exception was for first grade, in which the proportions were not different between the two samples for *Typical* growth. Alternatively, more students in Idaho achieved *Above Typical* growth in kindergarten and first grade, and *Accelerated* growth in all grade levels, compared to the national sample.

Figure 3. *Growth Pathway Distribution Comparison Between Idaho and National Sample by Grade Level*

Growth Pathway Distribution Between Idaho and National Sample

Idaho — National

Percentage of Students (%)

Idaho: K: 18, 16, 24*, 42* | 1st: 21, 19, 28*, 32* | 2nd: 11, 14, 22, 53* | 3rd: 9, 12, 21, 58*

National: K: 38*, 19*, 19, 24 | 1st: 30*, 20, 24, 26 | 2nd: 19*, 17*, 22, 42 | 3rd: 17*, 15*, 22*, 46

Legend: ■ Below Typical ■ Typical ■ Above Typical ■ Accelerated

*$p < 0.05$.

Istation Reading Growth and Usage Recommendation Comparison

The final portion of the analysis sought to determine how varying durations of the Istation Reading curriculum usage influences students' performance, indicated by the growth pathways in the previous section. In the following analyses, thresholds are estimated values where the probability of moving from one category to the next higher category is 50%. A lower (more negative) value suggests an easier transition into that level. A higher (more positive) value suggests a more difficult transition into that level. Threshold 1 corresponds with transitioning from *Below Typical* to *Typical*. Threshold 2 corresponds with transitioning from *Typical* to *Above Typical*. Threshold 3 corresponds with transitioning from *Above Typical* to *Accelerated*.

The results show that, overall, students meeting and exceeding curriculum usage recommendations have increased probabilities of achieving higher growth pathways (i.e., *Typical*, *Above Typical*, and *Accelerated*).

Table 6 shows the results for kindergarten students. Model 3 will be interpreted due to the lower Akaike information criterion (AIC) and Bayesian information criterion (BIC) values, indicating better model fit. Students meeting the usage recommendation had increased probabilities of achieving higher reading growth than those not meeting the recommendation, whereas students exceeding the usage recommendation did not have a statistically significant increased probability. Eighteen percent (18%) of the total variability in reading growth was due to schools, leaving 82% of the variability due to students. The significance of the error variance suggests that schools influence the variability in students' growth after accounting for usage. There was also variability in Istation curriculum usage across schools.

Table 6. *MEOLR Model for Kindergarten, Coefficient and Standard Error (SE)*

Fixed Effects	Model 1	Model 2	Model 3
Threshold 1	-1.79* (0.05)	-1.28* (0.07)	-1.28* (0.07)
Threshold 2	-0.78* (0.05)	-0.24* (0.07)	-0.24* (0.07)
Threshold 3	0.34* (0.05)	0.93* (0.07)	0.94* (0.07)
Baseline Percentile		0.01* (0.001)	0.01* (0.001)
Met Usage (20-40 min/wk)		0.39* (0.06)	0.34* (0.06)
Above Usage (>40 min/wk)		0.41* (0.08)	0.26 (0.11)
Error Variance			
Level-2 Intercept	0.72* (0.06)	0.74* (0.08)	0.70* (0.08)
Usage			0.10* (0.04)
Model Fit			
AIC	53420.7	28894.0	28871.5
BIC	53452.6	28945.8	28930.6

*$p < 0.05$; ICC: 0.18. Values based on Stata *meologit*.

Table 7 shows the results for first grade students. Students meeting the usage recommendation had increased probabilities of achieving higher reading growth than those with less usage. Students exceeding the usage recommendation also had a higher probability compared to those not meeting the recommendation. Thirteen percent (13%) of the total variability in reading growth was due to schools, leaving 87% of the variability due to students. The significance of the error variance suggests that schools influence the variability in students' growth after accounting for usage. There was also variability in Istation curriculum usage across schools.

Table 7. *MEOLR Model for Grade 1, Coefficient and Standard Error (SE)*

Fixed Effects	Model 1	Model 2	Model 3
Threshold 1	-1.59* (0.04)	-1.51* (0.06)	-1.53* (0.06)
Threshold 2	-0.53* (0.04)	-0.41* (0.06)	-0.42* (0.06)
Threshold 3	0.76* (0.04)	0.91* (0.06)	0.90* (0.06)
Baseline Percentile		0.003* (0.001)	0.003* (0.001)
Met Usage (20-40 min/wk)		0.19* (0.05)	0.17* (0.05)
Above Usage (>40 min/wk)		0.26* (0.06)	0.26* (0.08)
Error Variance			
Level-2 Intercept	0.49* (0.04)	0.44* (0.05)	0.41* (0.05)
Usage			0.07* (0.02)
Model Fit			
AIC	60913.4	33713.1	33679.1
BIC	-1.59* (0.04)	-1.51* (0.06)	-1.53* (0.06)

*$p < 0.05$; ICC: 0.13. Values based on Stata *meologit*.

Table 8 shows the results for second grade students. Neither of the curriculum usage groups had statistically significant increased probabilities of achieving higher reading growth. While there was a significant effect in those exceeding the recommendation in model 2, the impact was less pronounced or inconsistent when controlling for error variance related to usage. Thirteen percent (13%) of the total variability in reading growth was due to schools, leaving 87% of the variability due to students. The significance of the error variance suggests that schools influence the variability in students' growth after accounting for usage. There was also variability in Istation curriculum usage across schools.

Table 8. *MEOLR Model for Grade 2, Coefficient and Standard Error (SE)*

Fixed Effects	Model 1	Model 2	Model 3
Threshold 1	-2.43 (0.04)	-1.94 (0.06)	-1.95 (0.06)
Threshold 2	-1.33 (0.04)	-0.78 (0.06)	-0.79 (0.06)
Threshold 3	-0.22 (0.04)	0.37 (0.06)	0.37 (0.06)
Baseline Percentile		0.01* (0.001)	0.01* (0.001)
Met Usage (20-40 min/wk)		0.10 (0.05)	0.05 (0.06)
Above Usage (>40 min/wk)		0.29* (0.08)	0.11 (0.11)
Error Variance			
Level-2 Intercept	0.51* (0.05)	0.45* (0.06)	0.43* (0.04)
Usage			0.09* (0.06)
Model Fit			
AIC	53997.0	28885.8	28869.0
BIC	54029.3	28938.2	28928.8

*$p < 0.05$; ICC: 0.13. Values based on Stata *meologit*.

Table 9 shows the results for third grade students. Students meeting the usage recommendation had increased probabilities of achieving higher reading growth than those who used it less, whereas students exceeding the usage recommendation did not have a statistically significant increased probability. Twelve percent (12%) of the total variability in reading growth was due to schools, leaving 88% of the variability due to students. The significance of the error variance suggests that schools influence the variability in students' growth after accounting for usage. There was also variability in Istation curriculum usage across schools.

Table 9. *MEOLR Model for Grade 3, Coefficient and Standard Error (SE)*

Fixed Effects	Model 1	Model 2	Model 3
Threshold 1	-2.51* (0.04)	-1.91* (0.06)	-1.94* (0.06)
Threshold 2	-1.44* (0.04)	-0.78* (0.06)	-0.80* (0.06)
Threshold 3	-0.37* (0.04)	0.33* (0.06)	0.32* (0.06)
Baseline Percentile		0.02* (0.001)	0.02* (0.001)
Met Usage (20-40 min/wk)		0.26* (0.05)	0.22* (0.06)
Above Usage (>40 min/wk)		0.04 (0.09)	0.01 (0.12)
Error Variance			
Level-2 Intercept	0.46* (0.05)	0.37* (0.05)	0.34* (0.05)
Usage			0.11* (0.04)
Model Fit			
AIC	52219.8	27447.1	27412.8
BIC	52252.2	27499.4	27472.6

*$p < 0.05$; ICC: 0.12. Values based on Stata *meologit*.

Discussion

Adherence to Istation's usage recommendation (20–40 minutes/week) optimized reading gains across all grade levels. This optimal zone suggests that a balanced approach to digital learning is crucial for maximizing educational outcomes. Importantly, students who met these recommendations consistently outperformed both those who did not, and those without the Istation Reading curriculum, highlighting the importance of regular engagement with the curriculum to drive performance.

For educational stakeholders, these findings underscore the need to integrate structured digital learning time into the school schedule. Ensuring that students can consistently engage with the curriculum for the optimal duration could be supported by policies that facilitate access to technology and allocate time within the school day for such activities.

The analysis revealed significant benefits for students in Tier 1 and Tier 2, who generally require more academic

intervention. These students showed the most pronounced score and percentile growth, indicating that Istation is effective for those who start with lower baseline scores. This suggests that Istation Reading curriculum can level the playing field for students who may otherwise remain behind their peers.

Students in Idaho exceeded national averages in reading gains, demonstrating the effectiveness of the Istation curriculum in this state. This success can serve as a model for other regions and states considering similar educational technology implementations. The positive outcomes observed in Idaho relative to the national sample suggests that well-implemented digital learning tools can significantly enhance educational outcomes across diverse student populations.

The analysis also examined the influence of supplemental curriculum usage and BOY academic performance on students' academic growth. Regularly engaging with the curriculum for the recommended time consistently increased the probability of achieving higher growth relative to those not meeting the recommendation. By third grade, the BOY academic performance of students became a more significant predictor of success, suggesting a cumulative effect. This underscores the importance of early and consistent

engagement with educational resources, though exceeding the recommended usage time did not consistently yield additional benefits, indicating a potential optimal engagement threshold.

The success of the Istation curriculum in Idaho has broader implications for the adoption of technology in education. As digital tools become increasingly integrated into educational contexts, it's important to recognize their potential to not only supplement traditional learning but also to provide key interventions for students who require additional support. Furthermore, the data-driven nature of such tools allows for real-time assessments and adjustments to teaching strategies, aligning educational approaches more closely with individual student needs.

Conclusion

The Istation curriculum review in Idaho illustrates the substantial benefits of tailored digital learning programs in enhancing reading proficiency across various student groups. By adhering to recommended usage guidelines and focusing on the needs of at-risk students, schools can significantly boost academic performance. This study reinforces the value of integrating technology in education and provides a data-backed roadmap for its effective implementation to maximize student achievement.

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