# Mid-West Elementary School

# Regression Discontinuity Research Report


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# Introduction

This report is a summary of the Regression Discontinuity (RD) research conducted at an elementary school in the mid-west. During the 2014–2015 school year, Imagine Learning, in collaboration with the school, conducted RD research to determine the effect of using Imagine Learning on students' reading performance. The research study commenced in November 2014 with the administration of the Scantron Performance Series® assessments, and the intervention was implemented in January through May 2015. The results of this study reflect a partial year implementation of Imagine Learning in grades K–5.

# Background and Research Question

Imagine Learning is an instructional intervention designed to build language and literacy skills among students in kindergarten through fifth grade. The Imagine Learning software responds to the individual needs of students through intelligent placement and ongoing proficiency assessments. Imagine Learning teaches crucial competencies by providing instructional content that is research-based, scaffolded, and engaging. To improve language and literacy achievement, Imagine Learning features instruction in phonemic awareness, phonics, vocabulary, fluency, comprehension, grammar, and language development (both academic and conversational). The program aligns with Common Core standards and addresses skills students need to become proficient in reading.

Prior research has indicated that Imagine Learning is effective for improving reading achievement among English language learners (ELLs). In a quasi-experimental study conducted in a large school district in California, results indicated that ELLs in grades 2–5 who used Imagine Learning for a minimum of 30 hours during the school year improved in overall reading ability and in Lexile levels compared to peers who did not use Imagine Learning. Additionally, a concurrent randomized-controlled study in seven rural and urban school districts in Arizona indicated that ELLs in kindergarten and first grade significantly improved in reading ability as compared to students who did not use Imagine Learning. The kindergarten students in the study used Imagine Learning on average for 36.70 hours during the school year, and first-grade students averaged 31.20 hours.

Imagine Learning is designed to benefit not only ELLs but struggling readers as well. The purpose for this research is to determine the effect Imagine Learning has on reading achievement among kindergarten through fifth-grade students who are at risk for reading failure. Specifically, this research seeks to answer the following question:

> To what extent do reading achievement gains in overall reading scores differ for kindergarten through fifth-grade students who use Imagine Learning from those of kindergarten through fifth-grade students who do not use Imagine learning?

# Setting and Participants

This research took place at an elementary school in the mid-west. In October 2014, the school reported an enrollment of 552 students in grades K–5. Ninety-three percent of the students at the school qualified for free and reduced lunch. Seventy-nine percent of the school population were ELLs. Of the ELLs at the school, 52.7% were identified as Hispanic, 30% as Hawaiian/Pacific Islanders, and 13% as White.

Additionally, the school had a small percentage of African-American, Asian, and Native American populations.

All of the students enrolled in the school in November of 2014 were included in the study (a total of 541 students at the outset of the study). Students who enrolled in the school after the study began were not included in this research.

# Methodology

The design of the research was Regression Discontinuity (RD). RD is a type of quasi-experimental research in which treatment assignment is determined by a cut-point on a pre-assessment. An advantage for using regression discontinuity in educational settings is students who may benefit most from an intervention are not denied the intervention due to random assignment. The following describes conditions for this study:

- The rating or assignment variable was administered prior to the implementation of the intervention. In this study, the Scantron Performance Series® Reading Foundations (K–2) and Reading (2–12) assessments were administered in November 2014.
- Treatment assignment was based on students' scores in relation to the established cut-point. Students at the school were assigned to the Imagine Learning or control condition based on their Scantron Performance Series® scale scores on the Reading Foundations (K–2) and Reading tests. By grade level, the students who scored in the lowest 60% for their grade were assigned to use Imagine Learning. Students with Scantron scale scores that fell in the top 40% for their grade were assigned to the control condition. Assignments were not changed after the intervention was implemented.
- Factors that may have explained discontinuities were evaluated. No other factors were described that may have impacted the effect at the cut-points. In interviews with the principal and with school staff, all students within the same grades were exposed to the similar instructional conditions. Staff did not report competing interventions that were implemented during the same time period as the regression discontinuity study.

# Procedures

Based upon initial Scantron Performance Series® Reading Foundations (K–2) and Reading (2–12) scaled score results, students were assigned to two groups, those who would use Imagine Learning and those who would not. Students who fell in the bottom 60% (or .60) of scale scores for each grade level were assigned to the Imagine Learning intervention condition, with **279** students comprising this group. Table 1 summarizes assessment and usage information for this group.

**Table 1. Data for Imagine Learning Users**

| Imagine Learning Users | | | | | | | |
|---|---|---|---|---|---|---|---|
| Grade | Number of Students | Initial Reading Results | Post Reading Results | MAP Reading Winter 2014 | MAP Reading Spring 2015 | Average Intervention Hours | Average Intervention Sessions |
| K | 49 | 1325.9 | 1490.1 | 139.9 | 148.3 | 25.3 | 81.14 |
| 1 | 47 | 1466.9 | 1681.8 | 151.3 | 159.8 | 29.12 | 83.15 |
| 2 | 51 | 1741.9 | 1923.4* | 162.9 | 168.4 | 26.19 | 91.96 |
| 3 | 40 | 1969.4 | 2113.2 | 177 | 181 | 30.16 | 99.53 |
| 4 | 45 | 2144 | 2268.9 | 187.6 | 192.1 | 28.56 | 76.2 |
| 5 | 47 | 2308.4 | 2414.5 | 192.6 | 199.1 | 25.7 | 65.34 |

*Note:* Average test score results are reported for each grade level. Initial reading results for grades 3, 4, and 5 were drawn from the standard reading scaled scores from the November 2014 test administration. Initial reading results for grades K, 1, and 2 were drawn from the Reading Foundations scaled scores from the November 2014 test administration. Post reading results were drawn from the May 2015 test administration and reflected the same test type. *Grade 2 is the exception wherein Post reading results for this group were drawn from the standard reading scaled scores.

Students comprising the top 40% of Scantron Performance Series® Reading Foundations (K–2) and Reading (2–12) scale scores within each grade level were assigned to the control (no-intervention) condition, with **193** students assigned to this group. Table 2 provides basic information distinct to this group of students.

**Table 2. Data for Control Group Students**

| Control Group Students | | | | | |
|---|---|---|---|---|---|
| Grade | Number of Students | Initial Reading Results | Post Reading Results | MAP Reading Winter 2014 | MAP Reading Spring 2015 |
| K | 31 | 1514.4 | 1605.8 | 147.03 | 155.9 |
| 1 | 36 | 1903.1 | 1975.4 | 170.4 | 176.7 |
| 2 | 35 | 2122.2 | 2271.5* | 181.1 | 187.7 |
| 3 | 28 | 2406.3 | 2429.3 | 197.1 | 200.7 |
| 4 | 31 | 2709.2 | 2658.4 | 209.3 | 212.9 |
| 5 | 32 | 2796.1 | 2829.6 | 211.2 | 216.6 |

*Note:* Average test score results are reported for each grade level. Initial reading results for grades 3, 4, and 5 were drawn from the standard reading scaled scores from the November 2014 test administration. Initial reading results for grades K, 1, and 2 were drawn from the Reading Foundations scaled scores from the November 2014 test administration. Post reading results were drawn from the May 2015 test administration and reflected the same test type. *Grade 2 is the exception wherein Post reading results for this group were drawn from the standard reading scaled scores.

# Intervention Implementation

As a supplementary reading program, Imagine Learning has developed usage recommendations that maximize the benefit of the program. Those recommendations include session length (20–30 minutes per session depending on grade level), frequency of sessions (3–5 times a week depending on session length), and minimum levels of use to see significant growth (at least 20–30 hours per school year).

To support teachers in meeting students' instructional needs, Imagine Learning includes the following components for managing and responding to students' needs:

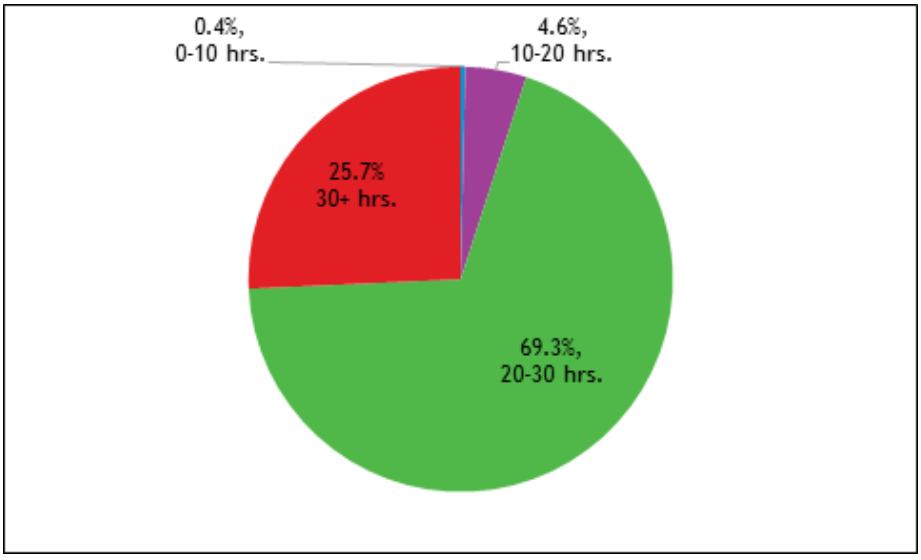
1. Reports on program performance (e.g., Action Areas Tool, Growth Tool, Group Summary, Group Usage, Individual Summary, Individual Detailed).
2. Intervention tools. Within the Action Areas Tool are intervention resources for students who do not demonstrate proficiency with program content. The Action Areas Tool includes alignments with standards, links to Imagine Learning instructional activities that align with the targeted skill areas, and supplemental resources for teachers for providing additional support and practice in specific areas.
3. Access to all instructional content.

When fully implemented, using Imagine Learning consists of students using the program at recommended levels, and teachers accessing and using program reports to gauge student progress and provide re-teaching and remediation when necessary (using program resources).

**95% of the students met minimum requirements for program usage.**

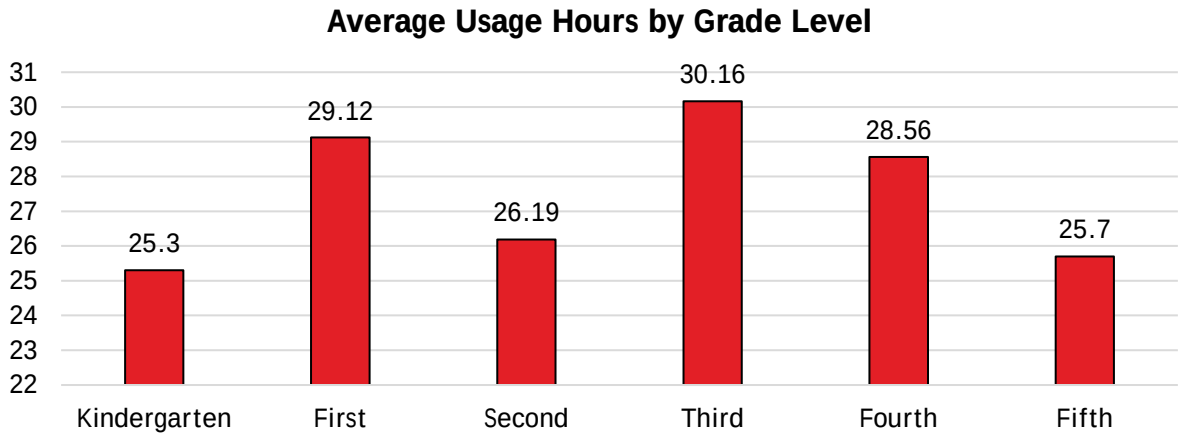
At the elementary school, almost all of the students included in the study met minimum requirements for usage (see figure 1). Ninety-five percent of the students used Imagine Learning for more than 20 hours from January to May. Only 0.4% of the students used Imagine Learning fewer than ten hours.

**Figure 1. Levels of Usage**




Usage across grade levels varied (see figure 2). Students in third grade had the highest average with 30.16 hours for January to May. First- and fourth-grade students used Imagine on average 29.12 and 28.56 hours, respectively. Kindergarten, second-, and fifth-grade students, on average, used Imagine Learning for 25.3, 26.19, and 25.7 hours, respectively.

**Figure 2. Average Usage Hours by Grade Level**




At the school, students used Imagine Learning in the school's computer labs and in their classrooms. Students in kindergarten through second grade used Imagine Learning in computer labs. Classroom or grade-level teachers accompanied students to the labs and supervised them while they used Imagine Learning. Teachers in these grades developed schedules that allowed for consistent use of the program among students in their classes. In using Imagine Learning, teachers in kindergarten through second grade reported that they did not consistently access Imagine Learning data and usage report information to monitor student progress. They monitored usage, but did not consistently review reports that reflected students' academic progress. Teachers also reported that students who used Imagine Learning did not miss core literacy instruction. Students who did not use Imagine Learning received other types of supplemental language arts instruction.

Students in grades 3–5 used Imagine Learning in both the computer labs and in their classrooms. Classroom or grade-level teachers supervised students while they used Imagine Learning. Similar to kindergarten through second grade, students who used Imagine Learning did not miss core literacy instruction. Teachers in grades 3–5 developed schedules that allowed for consistent use of the program among students in their classrooms. These teachers reported that they monitored usage, but did not consistently review reports that reflected students' academic progress. Students who did not use Imagine Learning received other types of supplemental language arts instruction including other online instruction and practice on various computer applications.

# Measures

**Scantron Performance Series®.** Scantron Performance Series® Reading Foundations (K–2) and Reading (2–12) assessments were administered to all students at the school in November, 2014 and in May 2015. The scale scores from the Reading Foundations (K–2) and Reading (2–12) assessments were used to assign students to Imagine Learning or control conditions. The scores from the May administration were used as a post-intervention assessment.

**Measures of Academic Progress.** Students' Northwest Evaluation Association's Measure of Academic Progress® (MAP) Reading scores were obtained from the Springdale Public Schools. The MAP Reading assessment was administered to kindergarten through fifth-grade students during the April 6 to May 1, 2015 testing window. MAP RIT scores were used as the outcome variable for the RD analysis. The MAP RIT scores were used because the MAP has the same scale for all grades, consistency in administration (some students experienced difficulty with sound settings when the Scantron post-tests were

administered), and more students completed the final MAP assessment than the Scantron assessments, thus increasing statistical power.

# Results

Several analyses were conducted with data gathered as part of this research study. Growth on the Scantron Performance Series® assessments and MAP assessment were calculated for students who used Imagine Learning and for students who did not use the program. These analyses accounted for levels of usage of Imagine Learning with scores analyzed for students with below and above 20 hours of use. Twenty hours of use represents Imagine Learning's minimum recommendation for benefitting from the program. The analyses of Scantron and MAP data highlight the impact of the program for students who did and did not meet the minimum requirement for usage. The RD analyses did not account for levels of use so those results are provided in the Scantron Performance Series® and MAP sections of the report.

A series of RD analyses were conducted for each grade level to determine the effect of Imagine Learning on students' reading achievement. The results of the RD analyses are presented separately following the results of growth on the Scantron Performance Series® and MAP® assessments.

**Scantron Performance Series® Reading Foundations (K–2) and Reading (2–12) Scores.** As previously stated, the November Scantron Performance Series® Reading Foundations (K-2) and Reading (2–12) scores were used for assignment to experimental conditions. Spring administration scores were not used for the RD analysis for reasons stated. In this section we report the outcomes of the Scantron pre- and post-assessments in terms of students' growth by levels of usage.

To report growth, students' scale scores[1] on the Reading Foundations (K–2) and Reading (2–12) assessments were calculated by subtracting students' November scale scores from their spring scale scores. Percentages of growth were calculated using the growth score. The scores of students with both pre- and post-assessments were analyzed. The scores of students who did not have both a pre- and post-assessment were not included in the analysis.

The Scantron Reading Foundations (K-2) assessment is intended for students in kindergarten through second grade. The Scantron Reading (2-12) test is designed for students in grades 2-12. In this study, kindergarten and first grade students completed the Scantron Reading Foundations (K-2) test for both administrations. The majority of second grade students completed the Reading Foundations (K-2) test in November and the Reading (2-12) test in May. Third through fifth grade students completed the Reading (2-12) assessment for both administrations.

Students in kindergarten and first grade completed the Scantron Reading Foundations (K–2) assessment. For students in these grades, students who used Imagine Learning for more than 20 hours demonstrated higher growth percentages than students who did not use Imagine Learning or who used Imagine Learning for fewer than 20 hours.

**Students in kindergarten and first grade who used Imagine Learning for more than 20 hours demonstrated higher growth than students who did not use Imagine Learning.**

Kindergarten and first grade combined, students who used Imagine Learning for more than 20 hours demonstrated on average 189.7 scale score growth, which represents 13.7% growth as compared to non-users and users of fewer than 20 hours who demonstrated 6.0% and 5.9% growth respectively (see figure 3 and table 3).

[1] The scale scores for the Scantron Performance Series® assessments are on the same scale. However, performance on the Reading Foundations (K–2) and Reading assessments are not comparable.

**Figure 3. Average Scantron Reading Foundations Percentage Growth**

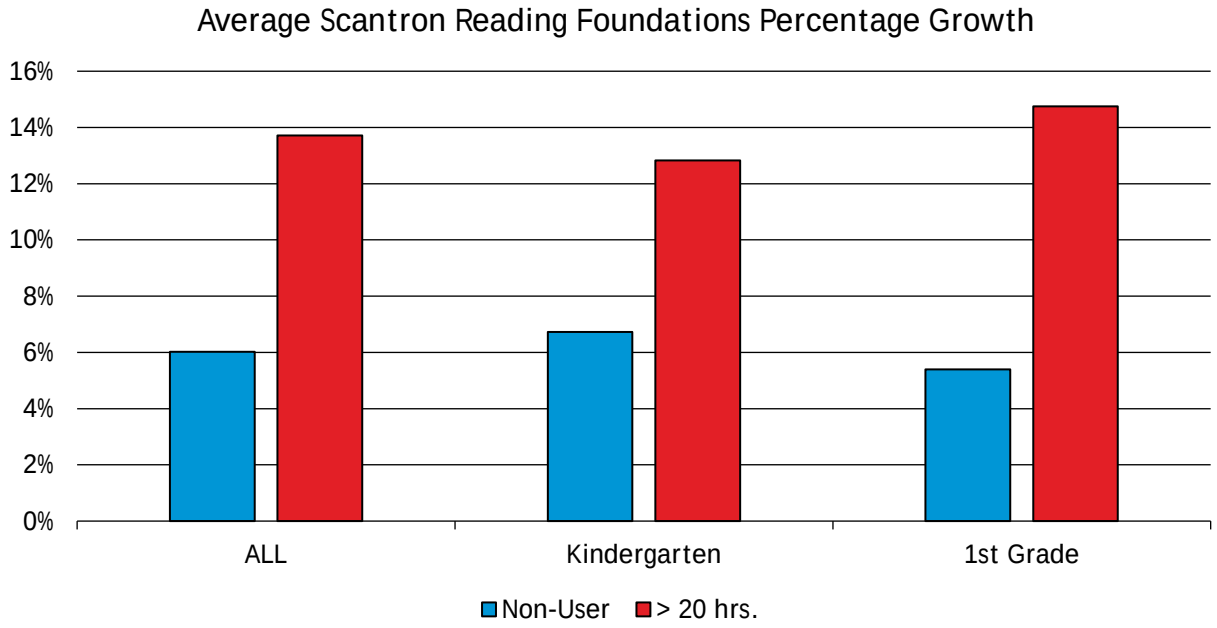



**Table 3. Average Reading Foundations Growth* and Growth Percentages**

| Reading Foundations | | | | | |
|---|---|---|---|---|---|
| **Grade** | **Count** | **Avg. Starting** | **Avg. Ending** | **Avg. Growth** | **Avg. Growth %** |
| ALL | 212 | 2359.0 | 2425.4 | 148.6 | 10.3% |
| < 20 hrs. | 7 | 1395.3 | 1481.4 | 86.1 | 5.9% |
| > 20 hrs. | 97 | 1401.1 | 1590.8 | 189.7 | 13.7% |
| Non-User | 70 | 1707.6 | 1805.5 | 97.9 | 6.0% |
| Kindergarten | 85 | 1400.3 | 1538.9 | 138.6 | 10.1% |
| < 20 hrs. | 4 | 1339.3 | 1400.8 | 61.5 | 4.5% |
| > 20 hrs. | 48 | 1327.1 | 1497.5 | 170.5 | 12.8% |
| Non-User | 33 | 1514.3 | 1615.9 | 101.6 | 6.7% |
| 1st Grade | 0 | 1645.9 | 1803.1 | 157.1 | 10.4% |
| < 20 hrs. | 3 | 1470.0 | 1589.0 | 119.0 | 7.7% |
| > 20 hrs. | 45 | 1465.3 | 1676.4 | 211.1 | 14.8% |
| Non-User | 37 | 1879.9 | 1974.5 | 94.6 | 5.4% |
| 2nd Grade | 0 | 1566.9 | 1746.9 | 180.0 | 12.8% |
| < 20 hrs. | 0 | --- | --- | --- | --- |
| > 20 hrs. | 4 | 1566.9 | 1746.9 | 180.0 | 12.8% |
| Non-User | 0 | --- | --- | --- | --- |

**Growth was calculated for students who completed Fall and Spring tests.*

Students in third through fifth grade completed the Scantron Reading (2–12) assessment. For students in these grades, students who used Imagine Learning for more than 20 hours demonstrated higher growth percentages than students who did not use Imagine Learning or who used Imagine Learning fewer than 20 hours.

**Students in second through fifth grade who used Imagine Learning for more than 20 hours demonstrated higher growth than students who did not use Imagine Learning.**

Third through fifth grades combined, students who used Imagine Learning more than 20 hours demonstrated on average 125.3 scale score growth, which represents 6% growth as compared to non-users and users of fewer than 20 hours who demonstrated -0.7% and -0.3% growth, respectively (see figure 4 and table 4).

**Figure 4. Scantron Reading Average Percentage Growth.**

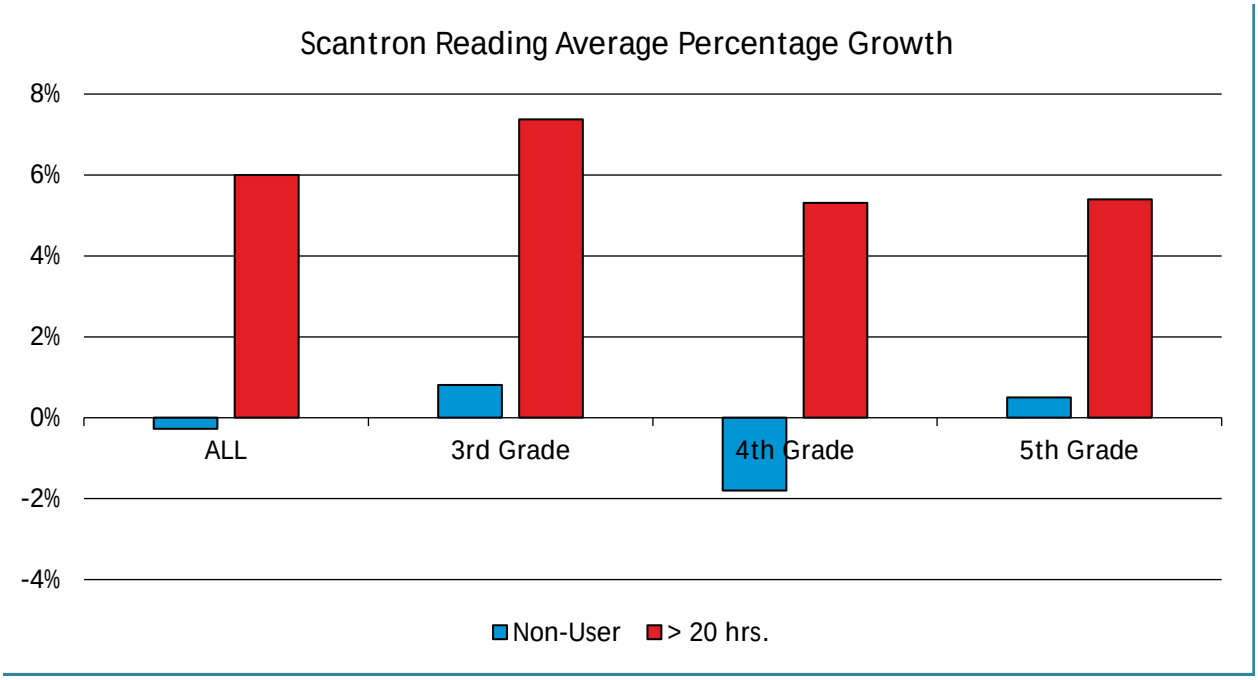



**Table 4. Scantron Reading Average Growth* and Growth Percentages.**

| Scantron Reading | | | | | |
|---|---|---|---|---|---|
| **Grade** | **Count** | **Avg. Starting** | **Avg. Ending** | **Avg. Growth** | **Avg. Growth %** |
| ALL | 212 | 2359.0 | 2425.4 | 66.4 | 3.2% |
| < 20 hrs. | 6 | 2296.8 | 2281.0 | -15.8 | -0.7% |
| > 20 hrs. | 119 | 2149.2 | 2274.5 | 125.3 | 6.0% |
| Non-User | 87 | 2650.3 | 2641.7 | -8.6 | -0.3% |
| 3rd Grade | 65 | 2154.4 | 2249.6 | 95.1 | 4.6% |
| < 20 hrs. | 0 | --- | --- | --- | --- |
| > 20 hrs. | 38 | 1974.3 | 2121.9 | 147.6 | 7.4% |
| Non-User | 27 | 2407.9 | 2429.3 | 21.3 | 0.8% |
| 4th Grade | 75 | 2404.9 | 2445.2 | 40.3 | 2.2% |
| < 20 hrs. | 2 | 2148.0 | 2248.0 | 100.0 | 4.5% |

| Scantron Reading | | | | | |
|---|---|---|---|---|---|
| Grade | Count | Avg. Starting | Avg. Ending | Avg. Growth | Avg. Growth % |
| > 20 hrs. | 40 | 2164.1 | 2276.4 | 112.4 | 5.3% |
| Non-User | 33 | 2712.5 | 2661.8 | -50.7 | -1.8% |
| 5th Grade | 72 | 2495.8 | 2563.4 | 67.6 | 0.0 |
| < 20 hrs. | 4 | 2371.3 | 2297.5 | -73.8 | -3.4% |
| > 20 hrs. | 41 | 2296.8 | 2414.0 | 117.3 | 5.4% |
| Non-User | 27 | 2816.6 | 2829.6 | 13.0 | 0.5% |

**Growth was calculated for students who completed Fall and Spring tests.*

**Scantron Performance Series® Scores of English Language Learners (ELLs).** As a separate analysis, the Scantron growth scores for ELLs were calculated. Eighty-eight percent of the kindergarten- and first-grade students who used Imagine Learning were ELLs. English language learners comprised 65.7% of the non-user group. For students in third through fifth grade who completed the Reading (2-12) test, 86.4% of the students who used Imagine Learning were ELLs. Sixty-four percent of the non-users were ELLs.

ELLs in kindergarten and first grade who used Imagine Learning for more than 20 hours demonstrated higher growth percentages on the Scantron Reading Foundations (K–2) assessment than ELLs who did not use Imagine Learning or who used Imagine Learning for fewer than 20 hours.

**ELLs who used Imagine Learning for more than 20 hours demonstrated higher growth than students who did not use Imagine Learning.**

Kindergarten and first-grade students combined, ELLs who used Imagine Learning more than 20 hours demonstrated on average 175.5 scale score growth, which represents 12.7% growth compared to non-users and users of fewer than 20 hours who demonstrated 5.5% and 5.9% percentage growth respectively (see figure 5 and table 5).

**Figure 5. Scantron Reading Foundations Average Percentage Growth—ELL Only**

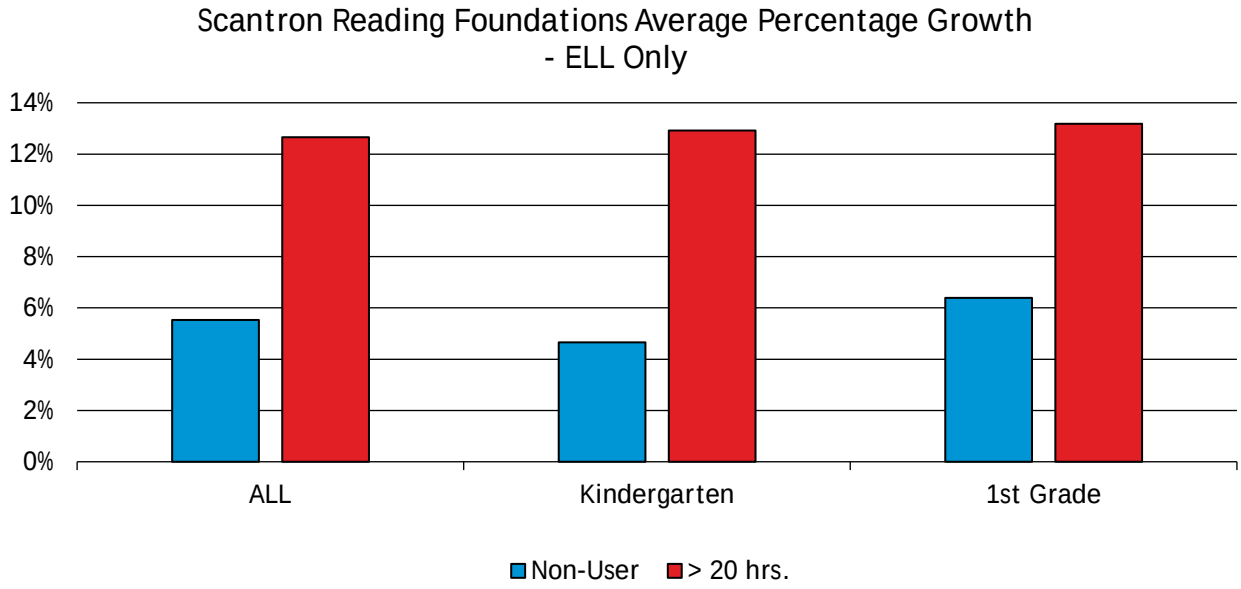


**Table 5. Scantron Reading Foundations Average Growth and Growth Percentages—ELL Only**

| Scantron Reading Foundations | | | | | |
|---|---|---|---|---|---|
| Grade | Count | Avg. Starting | Avg. Ending | Avg. Growth | Avg. Growth % |
| ALL | 138 | 2316.4 | 2393.0 | 143.5 | 9.9% |
| < 20 hrs. | 7 | 1395.3 | 1481.4 | 86.1 | 5.9% |
| > 20 hrs. | 85 | 1405.9 | 1581.4 | 175.5 | 12.7% |
| Non-User | 46 | 1689.4 | 1782.4 | 93.0 | 5.5% |
| Kindergarten | 69 | 1385.2 | 1516.9 | 131.7 | 9.7% |
| < 20 hrs. | 4 | 1339.3 | 1400.8 | 61.5 | 4.5% |
| > 20 hrs. | 42 | 1327.4 | 1499.3 | 171.9 | 12.9% |
| Non-User | 23 | 1498.9 | 1569.3 | 70.4 | 4.7% |
| 1st Grade | 66 | 1613.7 | 1774.4 | 160.7 | 10.6% |
| < 20 hrs. | 3 | 1470.0 | 1589.0 | 119.0 | 7.7% |
| > 20 hrs. | 40 | 1471.5 | 1661.3 | 189.8 | 13.2% |
| Non-User | 23 | 1879.8 | 1995.4 | 115.6 | 6.4% |
| 2nd Grade | 3 | 1632.2 | 1667.2 | 35.0 | 2.1% |
| < 20 hrs. | 0 | --- | --- | --- | --- |
| > 20 hrs. | 3 | 1632.2 | 1667.2 | 35.0 | 2.1% |
| Non-User | 0 | --- | --- | --- | --- |

**Growth was calculated for students who completed Fall and Spring tests.*

ELLs in third through fifth grade completed the Scantron Reading (2–12) assessment. For students in these grades, ELLs who used Imagine Learning more than 20 hours demonstrated higher growth percentages than ELLs who did not use Imagine Learning or who used Imagine Learning for fewer than 20 hours.

**English language learners in second through fifth grade who used Imagine Learning for more than 20 hours demonstrated higher growth than students who did not use Imagine Learning.**

Third - through fifth-grade students combined, ELLs who used Imagine Learning more than 20 hours had on average 125.5 scale score growth, which represents 6.0% growth compared to non-users and users of fewer than 20 hours who demonstrated -0.6 and 6.2% percentage growth, respectively (see figure 6 and table 6).

**Figure 6. Scantron Reading Average Percentage Growth—ELL Only**

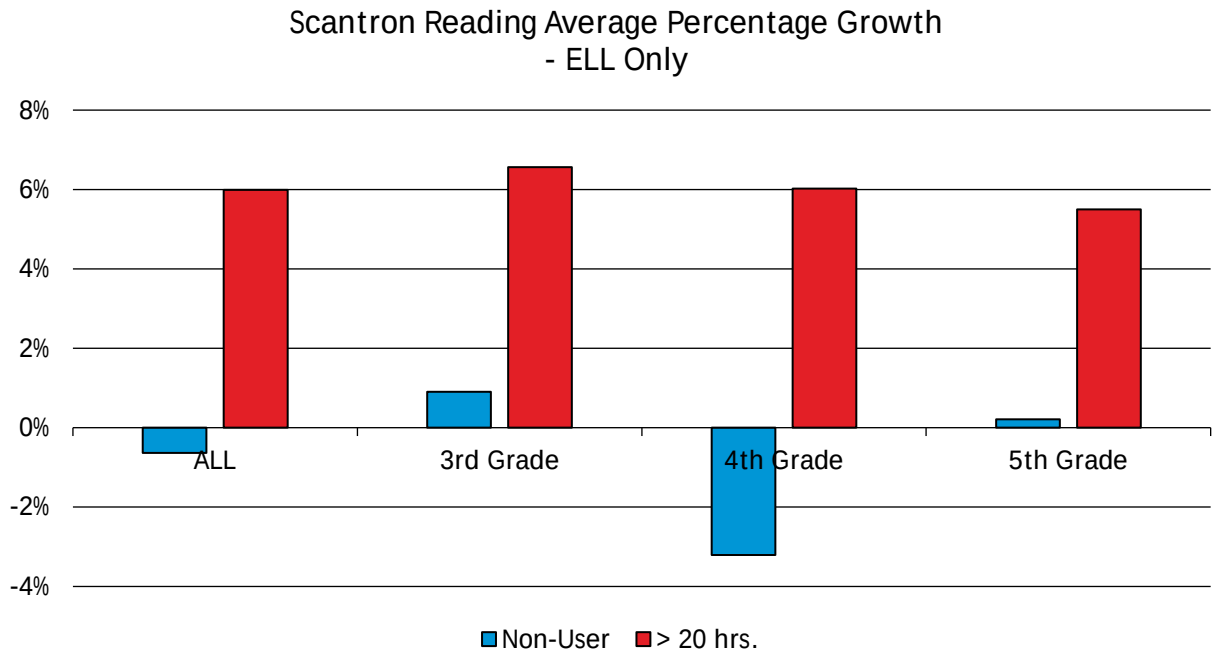



**Table 6. Scantron Reading Average Growth and Growth Percentages**

| Scantron Reading | | | | | |
|---|---|---|---|---|---|
| **Grade** | **Count** | **Avg. Starting** | **Avg. Ending** | **Avg. Growth** | **Avg. Growth %** |
| **ALL** | **164** | **2316.4** | **2393.0** | **76.6** | **3.7%** |
| < 20 hrs. | 3 | 2261.0 | 2405.7 | 144.7 | 6.2% |
| > 20 hrs. | 105 | 2161.3 | 2286.7 | 125.5 | 6.0% |
| Non-User | 56 | 2610.4 | 2591.6 | -18.7 | -0.6% |
| **3rd Grade** | **52** | **2134.0** | **2222.7** | **88.6** | **4.4%** |
| < 20 hrs. | 0 | --- | --- | --- | --- |
| > 20 hrs. | 32 | 1975.3 | 2105.6 | 130.3 | 6.6% |
| Non-User | 20 | 2388.1 | 2410.0 | 22.0 | 0.9% |
| **4th Grade** | **53** | **2328.1** | **2381.6** | **53.5** | **2.8%** |
| < 20 hrs. | 1 | 1901.0 | 1967.0 | 66.0 | 3.5% |
| > 20 hrs. | 34 | 2158.9 | 2286.1 | 127.2 | 6.0% |
| Non-User | 18 | 2671.6 | 2585.1 | -86.5 | -3.2% |
| **5th Grade** | **59** | **2466.7** | **2553.4** | **86.7** | **4.0%** |
| < 20 hrs. | 2 | 2441.0 | 2625.0 | 184.0 | 7.5% |
| > 20 hrs. | 39 | 2316.0 | 2435.9 | 119.9 | 5.5% |
| Non-User | 18 | 2796.1 | 2800.0 | 3.9 | 0.2% |

**MAP RIT Scores.** As previously stated, students' MAP RIT scores were used as the outcome variable for the RD analysis. In this section we report the growth scores and growth percentages using students' winter and spring MAP RIT data. To report growth, students' MAP RIT scores were calculated by subtracting students' winter RIT scores from their spring RIT scores. Growth percentages were calculated using growth scores. The MAP RIT scores of students with both winter and spring were included in this analysis.

Students in kindergarten, first, third, fourth, and fifth grade who used Imagine Learning for more than 20 hours demonstrated higher growth percentages than students who did not use Imagine Learning or how used Imagine Learning for fewer than 20 hours. Students who did not use Imagine Learning in second grade demonstrated higher growth percentages than students who used Imagine Learning (see figure 7 and table 7).

**Students in kindergarten, first, third, fourth, and fifth grade who used Imagine Learning more than 20 hours demonstrated higher RIT score growth than students who did not use Imagine Learning.**

**Figure 7. Percent Growth in MAP RIT Scores from Winter to Spring**

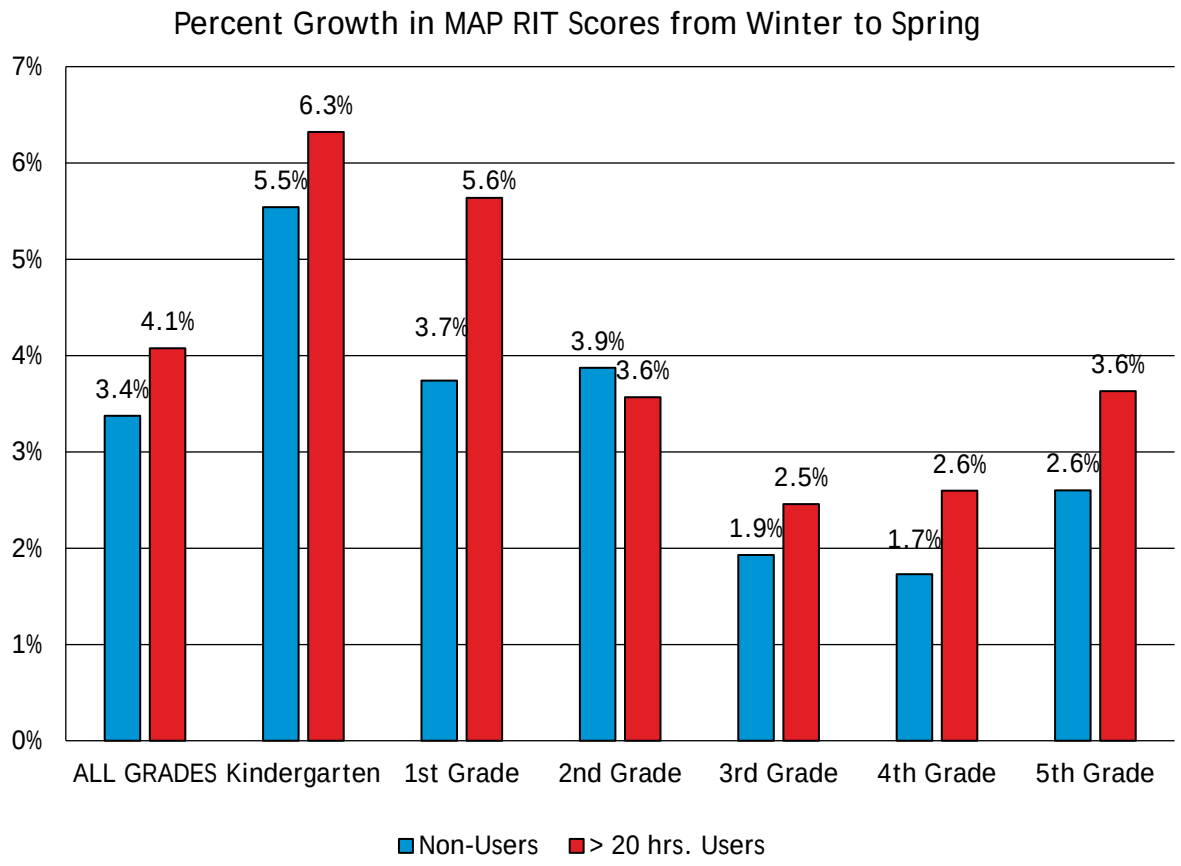


**Table 7. MAP RIT Average Score Growth and Percentages from Winter to Spring**

| MAP RIT Scores | | | | | |
|---|---|---|---|---|---|
| Grade | Count | Avg. Starting | Avg. Ending | Avg. Growth | Avg. Growth % |
| **ALL GRADES** | **479** | **30.6** | **180.7** | **6.0** | **3.7%** |
| < 20 hrs. | 14 | 163.5 | 166.9 | 3.4 | 2.2% |
| > 20 hrs. | 266 | 168.0 | 174.5 | 6.4 | 4.1% |
| Non-User | 199 | 181.9 | 187.6 | 5.6 | 3.4% |
| **Kindergarten** | **85** | **142.4** | **150.6** | **8.2** | **5.8%** |
| < 20 hrs. | 4 | 139.5 | 141.8 | 2.3 | 1.6% |
| > 20 hrs. | 46 | 140.1 | 148.8 | 8.8 | 6.3% |
| Non-User | 35 | 145.9 | 153.9 | 8.0 | 5.5% |
| **1st Grade** | **83** | **159.6** | **167.1** | **7.5** | **4.8%** |
| < 20 hrs. | 2 | 153.0 | 160.0 | 7.0 | 4.7% |
| > 20 hrs. | 45 | 151.2 | 159.8 | 8.5 | 5.6% |
| Non-User | 36 | 170.4 | 176.7 | 6.3 | 3.7% |
| **2nd Grade** | **88** | **170.2** | **176.2** | **6.0** | **3.7%** |
| < 20 hrs. | 3 | 151.7 | 155.7 | 4.0 | 2.6% |
| > 20 hrs. | 48 | 163.6 | 169.2 | 5.6 | 3.6% |
| Non-User | 37 | 180.3 | 186.9 | 6.6 | 3.9% |
| **3rd Grade** | **68** | **185.3** | **189.1** | **3.8** | **2.2%** |
| < 20 hrs. | 0 | --- | --- | --- | --- |
| > 20 hrs. | 40 | 177.0 | 181.0 | 4.0 | 2.5% |
| Non-User | 28 | 197.1 | 200.7 | 3.6 | 1.9% |
| **4th Grade** | **76** | **196.5** | **200.6** | **4.1** | **2.2%** |
| < 20 hrs. | 1 | 177.0 | 177.0 | 0.0 | 0.0% |
| > 20 hrs. | 44 | 187.9 | 192.5 | 4.6 | 2.6% |
| Non-User | 31 | 209.3 | 212.9 | 3.5 | 1.7% |
| **5th Grade** | **79** | **200.0** | **206.0** | **6.1** | **3.1%** |
| < 20 hrs. | 4 | 198.3 | 201.5 | 3.3 | 1.8% |
| > 20 hrs. | 43 | 191.7 | 198.6 | 6.9 | 3.6% |
| Non-User | 32 | 211.2 | 216.6 | 5.3 | 2.6% |

**Regression Discontinuity Analysis.** The RD analysis was conducted to determine if there was a treatment effect observed in students who used Imagine Learning. The data for this study were analyzed by an external researcher Dr. Monica Heller, a professor of psychology at Ball State University. Dr. Heller has no affiliation with Imagine Learning. Prior to analyzing the data, Dr. Heller tested assumptions for conducting the analysis. The following are assumptions of RD:

1) The variables of interest to this project were examined to ensure they are normally-distributed. The data can be assumed to be normally-distributed for all variables across all grade levels with the exception of initial reading results for kindergarten students. For this group, the data were outside of normal range in both kurtosis and skew. However for all grades combined, initial reading results fell within normal range.
2) The assignment variable must be a continuous variable; students' initial Scantron Performance Series® scaled score percentiles were a continuous variable.
3) Visual examination of the assignment variable should indicate that no stark differences exist in frequency immediately before or after the cut-point (i.e., density). Based upon examination of this variable, no stark differences were detected before or after the cut-point of .60.
4) Visual examination of the relationship between the assignment variable and outcome variable should indicate no other discontinuities exist besides that expected at the cut-point. Based upon examination of the relationship between these two variables, no other discontinuities were detected.
5) There should be a clear assignment of students to either the intervention or no-intervention group. This condition was satisfied. Additionally, cases were removed where intervention-group students did not meet the minimum time-exposure threshold. This will assist in better control of potential bias in estimates.
6) To detect unbiased estimates and increase the confidence in the reliability of the results, larger sample sizes are necessary in Regression Discontinuity analyses. Unfortunately, this is a major limitation in this project. The number of complete cases is relatively small overall with 472 total cases (279 intervention, 193 no-intervention). The number of cases included became further constrained when observations were eliminated by selecting an appropriate bandwidth for the intended analyses. Furthermore, as separate analyses were conducted via each grade level, the sample size was further reduced. Small sample sizes limit the power to detect effects; this is a major threat to validity.

**The sample size for this study was a significant limitation for interpreting results.**

In order to complete the RD analyses, only scores from students with all data essential to the analyses were included. The data from students were excluded from the analysis for the following reasons:

- Missing Initial Scantron Reading Results—we could not determine student assignment in relation to the designated cut-point location without these values (three students were removed).
- Students assigned to the intervention group failed to meet the minimum time-exposure threshold (ten hours) deemed essential for this particular intervention (an additional 21 students were removed).
- Missing spring MAP Reading results—as the specified outcome variable, this value was required for analysis purposes (an additional 40 students were removed).
- MAP Reading results—student growth from the winter to spring administrations could not be determined without this value (an additional five students were removed).

Based upon the initial data preparation and review, a series of Regression Discontinuity (RD) analyses were conducted to determine if there was an observed treatment effect on those students who engaged in the Imagine Learning reading intervention program. As previously described, for those analyses conducted at each separate grade level, student spring MAP results were utilized as the outcome

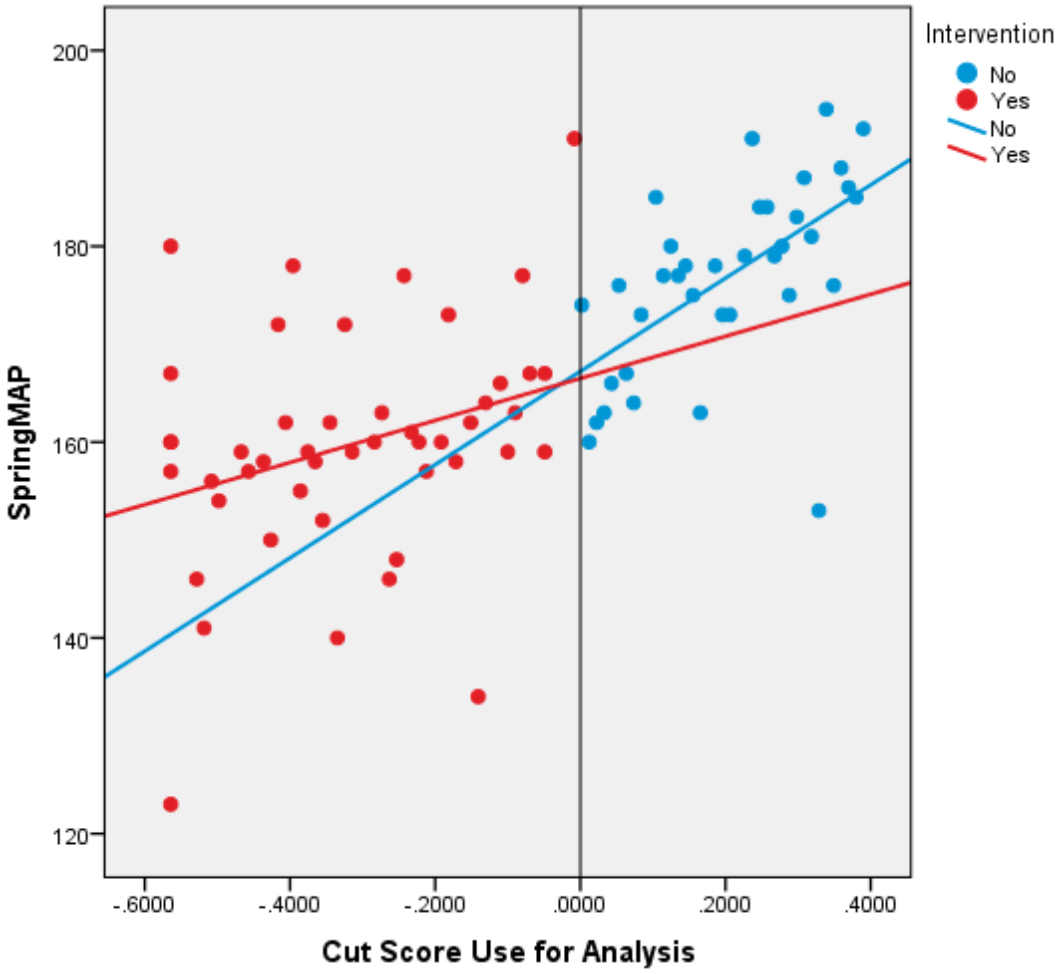
performance measure for the student groups. In this section we present the results for each grade level separately.

**Kindergarten.** The scores of 80 kindergarten students were included in this analysis. Based upon the RD analysis, the estimate of the effect of the Imagine Learning intervention program was positive at **5.41**. However, this effect was not statistically significant. As shown in the figure below, the slopes of the lines for the two groups were different, and this difference was statistically significant. The relationship between the initial Scantron Performance Series® score and students spring MAP performance behaved as expected for those kindergarten students who did not engage in the Imagine Learning intervention program. However, for the kindergarten students who engaged in the intervention program, those whose assignment value fell in the lowest end performed similarly on average to those whose assignment value approached the cut-off. Essentially, this suggests that those kindergarten students with the lowest initial reading results may have reaped greater benefit from the intervention program compared to the other students who also participated in the intervention program (see figure 8).

**Figure 8. Kindergarten Regression Discontinuity Analysis**

**First Grade.** The scores of 83 first-grade students were included in this analysis. Based upon the RD analysis, the estimate of the effect of the Imagine Learning intervention program was negative at **-2.21**, and this effect was not statistically significant. Additionally, the slopes of the lines for the two groups did not differ significantly from each other (see figure 9).

**Figure 9. First-Grade Regression Discontinuity Analysis**



**Second Grade.** The scores of 86 second-grade students were included in this analysis. Based upon the RD analysis, the estimate of the effect of the Imagine Learning intervention program was positive at **2.99**, and this effect was not statistically significant. Additionally, the slopes of the lines for the two groups did not differ significantly from each other (see figure 10).

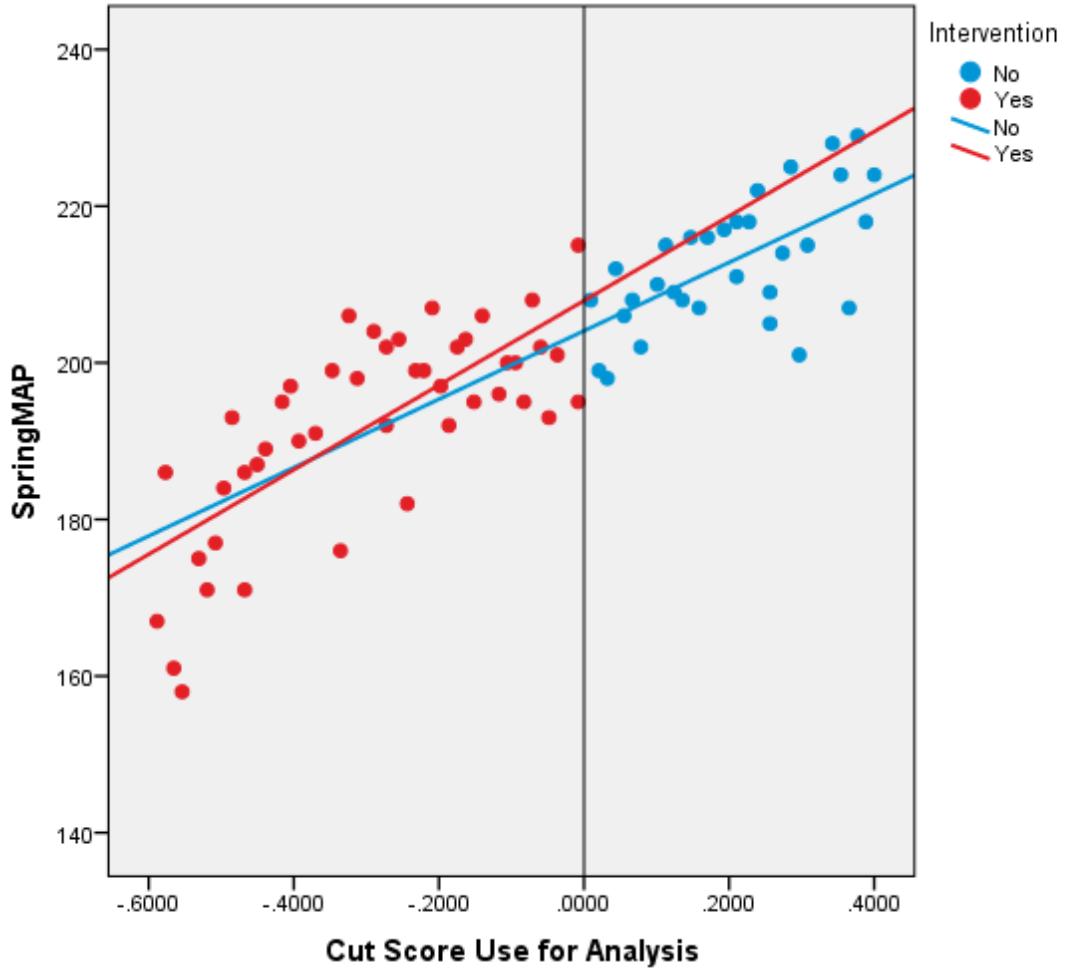
**Figure 10. Second Grade Regression Discontinuity Analysis**

**Third Grade.** The scores of 68 third-grade students were included in this analysis. Based upon the RD analysis, the estimate of the effect of the Imagine Learning intervention program (i.e., treatment) was positive at **10.50, and this difference was statistically significant**. Therefore, there was a significant treatment effect observed in the third-grade intervention group**.** This value identifies the mean impact of the intervention program on the spring MAP reading results for those students at or close to the cut-point who participated in the intervention program; it does not necessarily represent the effect on students that are distanced from the cut-point. The slopes of the lines for the two groups did not differ significantly from each other (see figure 11).

**Figure 11. Third Grade Regression Discontinuity Analysis**

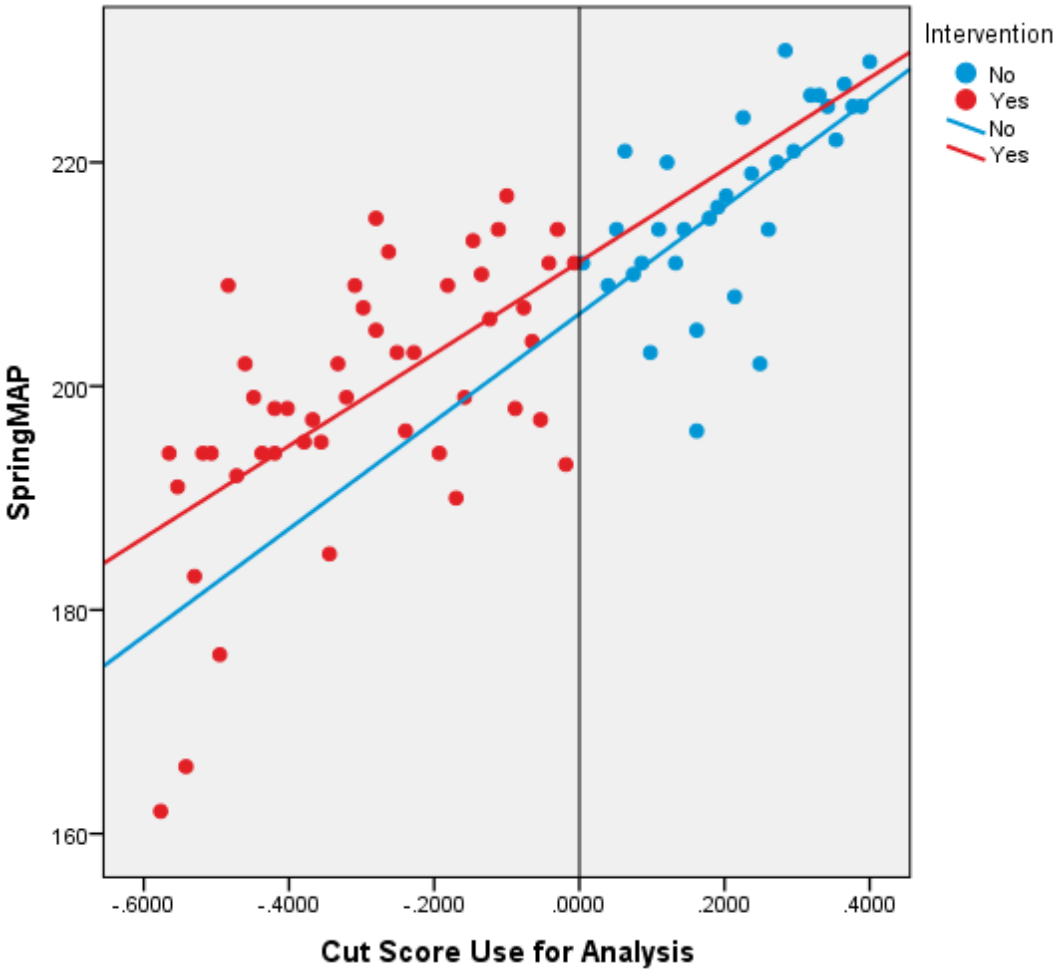
**Fourth Grade.** The scores of 76 fourth-grade students were included in this analysis. Based upon the RD analysis, the estimate of the effect of the Imagine Learning intervention program was positive at **4.701**, and this effect was not statistically significant. Additionally, the slopes of the lines for the two groups did not differ significantly from each other (see figure 12).

**Figure 12. Fourth Grade Regression Discontinuity Analysis**



**Fifth Grade.** The scores of 79 fifth-grade students were included in this analysis. Based upon the RD analysis, the estimate of the effect of the Imagine Learning intervention program was positive at **3.993**, and this effect was not statistically significant. Additionally, the slopes of the lines for the two groups did not differ significantly from each other (see figure 13).

**Figure 13. Fifth Grade Regression Discontinuity Analysis**




# Conclusions and Limitations

**Students who used Imagine Learning for more than 20 hours demonstrated higher percentages of growth than student who did not use Imagine Learning or who used Imagine Learning for fewer than 20 hours.**

The students in this study who received Imagine Learning as an intervention were students with the lower scores on the initial Scantron Performance Series® Reading Foundations (K–2) and Reading (2–12) assessments. The results of this study reflect a partial-year implementation. The analysis of the Scantron Reading Foundations (K–2) and Reading (2–12) scores indicated that students who used Imagine Learning for more than 20 hours demonstrated more growth than students who did not use Imagine Learning. Additionally, English language learners (ELLs) who used Imagine Learning for more than 20 hours demonstrated more growth than ELLs who did not use Imagine Learning. Of particular note were the results for the ELLs in third through fifth grade who used Imagine Learning. They demonstrated positive growth whereas ELLs in

grades 3–5 who did not use Imagine Learning demonstrated negligible or negative growth on the Scantron Reading (2–12) assessment.

Consistency in usage is an important factor in evaluating the impact of an online intervention. The results of the Scantron Performance Series® analysis indicated that higher levels of Imagine Learning use were associated with higher growth scores on the Scantron Reading Foundations (K–2) and Reading (2–12) assessments. Similarly, the analysis of MAP RIT-score growth indicated that students in kindergarten, first-, third-, fourth-, and fifth- grade who used Imagine Learning for more than 20 hours demonstrated greater growth than students who did not use Imagine Learning. These finding are important particularly for the ELLs and for the students at-risk for reading failure. The results indicate that Imagine Learning provides support for addressing achievement gaps for these students.

The RD analyses indicated a significant intervention effect for third-grade students. Those students experienced statistically significant gains in their spring MAP reading results compared to the expected gains observed in the students who did not engage in the intervention program. This result could indicate that for third-grade students whose achievement is lower relative to grade level peers, the program provides support for accelerating growth and closing achievement gaps. Although there was no distinct benefit observed for the kindergarten students who engaged in the Imagine Learning intervention program, the results suggest those students with the lowest initial Scantron Performance Series® Reading Foundations (K–2) scores gained more from the intervention compared to the students whose initial performance was better on average.

For the kindergarten students included in this study, the potential for a 'flooring effect' existed. Twenty-eight percent (28%) of the kindergarten students earned the lowest possible score (1300) on their initial Scantron Reading Foundations (K–2) test, which is a rather high proportion of students (and outliers). This score could represent a varied-degree of actual ability across these students as the underlying reason why they earned a 1300 is unknown (e.g., did not complete items). If these students have higher initial ability but this was not detected by the initial reading test, this could confound the results of the study in estimating the influence of the intervention program on their spring MAP reading results as well as an accurate growth score calculation for analysis purposes. This concern should also be taken into consideration when interpreting the results of the RD and the observed difference in slopes between the two groups of kindergarten students. It is possible the large number of outliers in this particular group influenced the results.

It should be noted that although the RD results for second-, fourth-, and fifth-grade students were not statistically significant, the RD effects for students who used Imagine Learning in these grades were positive, which could hold practical significance in terms of academic improvement. As previously discussed, the sample sizes in this study were a significant limitation. It is possible that the limited sample sizes made it difficult to detect significant differences in these grades. In contrast, the effects for first-grade students who used Imagine Learning were negative. These results conflict with the results from a large, randomized control study conducted in 16 elementary schools in which kindergarten and first-grade students demonstrated significantly greater growth in reading achievement than peers in control schools who do not use Imagine learning. The small sample size for first grade and the variability in scores may have impacted the results.

When interpreting the results of the RD analyses, caution must be taken given the influence of the small sample sizes on the analyses utilized in this project. The majority of the analyses conducted in this project tested groups with sample sizes fewer than 100 cases. As stated in earlier sections, results from RD analyses are more robust and reliable with larger sample sizes. Therefore, even significant findings in this study should be considered carefully.

**The results of the RD analyses should be interpreted with caution. Results from RD are more robust and reliable with larger sample sizes.**

# Recommendations

**Continue implementing Imagine Learning at recommended levels to achieve desired academic results.**

The results of this study indicated positive results in terms of growth on Scantron Performance Series® assessments for students who used Imagine Learning for more than 20 hours. Similar results for MAP RIT score growth were found among students who used Imagine Learning for more than 20 hours, with the exception of second-grade students. To continue to support academic growth, Imagine Learning should be used consistently so that all students who use the program complete at least 20 hours during a school year to maximize the educational benefits of the program. At the school, the support provided by the principal, Ms. Heather Cooper, the grade-level teams, along with the school-wide initiative for using Imagine Learning, resulted in consistent use by the vast majority of students who were assigned to use the program. This level of support is necessary for continuing the successful implementation at the school and achieving desired results in terms of growth in reading skills.

In using Imagine Learning, reports provide data on student progress within the program and in mastering specific skills. To further support student growth, teachers can access reports and resources for monitoring progress and addressing students' instructional needs. Specifically, the Action Areas Tool provides detailed information on skills students are not mastering and includes resources for extra practice and for re-teaching. Using Action Areas Tool resources could increase the effectiveness of the program. Imagine Learning representatives can provide additional training on using reports and integrating Imagine Learning content with classroom instruction.

As discussed in this report, the results of the RD analysis should be interpreted with caution. The limited sample sizes per grade level were significant limitations of the study. To verify the results, a larger study across several schools should be conducted. Samples per grade level should include at least 400 students with a minimum of 200 students assigned to both intervention and to control conditions. Large samples are needed to increase statistical power to confirm positive effects for third-grade students and to detect significant positive effects with kindergarten, second-, fourth-, and fifth-grade students. Finally, large samples for first grade could determine if the results in this study were atypical or an accurate reflection of the program's impact on first-grade students' reading achievement among students at the elementary school.