

# **The Effect of a Summer Enrichment Program on Improving Academic Success for Latino Students in Poverty**

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## **Background**

The traditional academic calendar has long given rise to concerns about “summer loss.” The average loss for students in grades 1 through 9 have been estimated at 1 month of instruction, with more deleterious effects at grades 3 and higher and in math (Cooper, Nye, Charleton, Lindsay, & Greathouse, 1996). Low-income students lose more ground over the summer than more affluent peers (Benson & Borman, 2010; Cooper et al., 1996), and the loss is cumulative, contributing to the achievement gap between low- and high-income students (McCombs, Augustine, Schwartz, Bodilly, McInnis, Lichter, et al., 2011).

## **Purpose and Research Question**

Under its Race to the Top—District (RttT-D) grant, IDEA Public Schools launched a summer program initiative for secondary grades, determining that the offerings should be diverse and relevant for all students. IDEA developed a summer enrichment program with broader content than teachers typically incorporate during the school year.

IDEA program leaders partnered with us to identify the key analyses they needed to understand whether they should continue to invest in the summer enrichment program.

This paper addresses the research question: What is the effect of participating in the summer enrichment program on students’ reading and math achievement scores?

## **Setting**

IDEA Public Schools is one of the fastest-growing charter management organizations in the country, founding its first school in 2001 in rural Rio Grande Valley (RGV) and growing to 61 schools in fall 2017.

## **Participants**

The study included 192 participants (rising 6<sup>th</sup>- through 11<sup>th</sup>-graders) at nine campuses offering the summer enrichment program in 2015. The participants were voluntary, 92% Latino, 88% eligible for free or reduced-price lunch, 12% English learners, and 5% special education (Table 1).

## **Program**

The summer enrichment program was a daily, 4-hour class for 4 weeks. In spring 2015, IDEA teachers proposed courses that were high student interest and related to an academic need.

Central administrators reviewed and approved the proposed courses. Teachers developed the courses, recruited students, and taught the course at their respective campuses. Courses ranged from academically-oriented classes, e.g., Intro to Spanish and AP Calculus Boot Camp, to classes exposing students to new experiences, e.g., Photography and Fundamentals of Music and Performance.

## Research Design

Because participation was voluntary and IDEA's goal was to provide all interested students with a summer experience, random assignment to the summer enrichment program was not possible. This study thus used a quasi-experimental approach to approximate the program impact that might have been found with a randomized controlled trial (Becker & Ichino, 2002).

Our analysis used propensity score weights to estimate the impact of summer enrichment participation on improving students' academic performance, adjusted for potential confounding baseline covariates (Rosenbaum and Rubin, 1983). This approach weights the comparison group to create balance with the treatment group on observed covariates and thus estimates the effect of summer enrichment for the participants. We selected weighting over other approaches, such as matching, because weighting successfully yielded a comparison group equivalent to the treatment group at baseline using the available data (Table 1), provided flexibility with the distribution of the data, and retained all subjects in the analysis, maximizing statistical power to detect program effects.

After propensity score weighting for comparison students, we examined the differences in standardized mean scores between treatment and comparison groups to assure that they were less than 0.25, thereby demonstrating covariate balance (What Works Clearinghouse, Institute of Education Sciences, 2014).

## Data Collection and Analysis

Student demographic and achievement data came from IDEA administrative datasets. We requested student-level data including demographics, scale scores and normal curve equivalents on district-administered Renaissance STAR reading/ELA and math tests, and scale scores on the state-administered ELA tests. Summer enrichment teachers provided participant rosters.

We estimated the average treatment on treated (ATT) of summer enrichment program participation using two-level (students nested in schools) weighted hierarchical linear modeling (HLM) (Raudenbush & Bryk, 2002), adjusting for the estimated propensity of participation.

Dependent variables were Renaissance STAR Reading and Math scores measured in fall 2015, winter 2015, and spring 2016, and STAAR reading scores measured in spring 2016. Independent variables included a constant, a pretest score on the same outcome measure, demographic characteristics, and treatment indicator. The model was thus:

$$Y_{is}^{posttest} = \beta_0 + \beta_1 Pretest + \beta_2 Summer + \beta_3 COV_{is} + \gamma_{is} + \mu_{os},$$

where  $i$  represents student,  $s$  represents schools;  $Y_{is}^{posttest}$  is dependent variable;  $Pretest$  is the baseline test score on the same measure;  $Summer=1$  for students who attended summer enrichment classes and 0 for those who did not;  $COV_{is}$  is student demographic covariates; and  $\gamma_{is}$  and  $\mu_{os}$  are student and school random effects.

Tables 2 to 4 provide detailed model results for each outcome.

## Results

After controlling for baseline demographic characteristics and pre-test scores from spring 2015, we found that summer enrichment program participation had a promising impact on academic achievement during the following school year. There was a significant, positive, and increasingly larger effect of summer enrichment participation on Renaissance STAR reading test scores across all three administrations (fall 2015, winter 2016, and spring 2016), after controlling for baseline demographic characteristics and pre-test score from spring 2015 (Table 5). The effect size of summer enrichment participation effect on Renaissance STAR reading scores ranged from 0.11 to 0.23.

The summer enrichment program showed similar patterns in improving Renaissance STAR math test scores in 2015–16 (Table 5). Effect sizes were 0.10, 0.33, and 0.15 in fall, winter, and spring, respectively. We also found a positive and significant effect of summer enrichment participation on the 2016 state STAAR reading scores (Table 5) with an effect size of 0.18.

## Conclusions

These results pertain to 1 year of implementation and need to be tested in subsequent years to confirm the summer enrichment participation effect or understand the conditions surrounding variable effects across years, for example through changing course offerings and changing participant characteristics.

IDEA intended its RttT-D initiatives to be pilots and refined them based on experience, implementation data, and evidence of effectiveness. These first-year results, in addition to feedback from teachers and students, encouraged IDEA to continue the summer enrichment program, expanding to secondary campuses systemwide and diversifying the enrichment classes offered.

## References

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**Table 1. Baseline Descriptive Analysis of Students, Summer Enrichment Participant Sample vs. Non-Weighted Comparison Sample and vs. Propensity Score Weighted Comparison Sample**

| Variables  | Summer<br>Enrichment<br>Participant<br>n=192 | Non-Weighted<br>Comparison<br>n=6780 | Weighted<br>Comparison<br>n=6780 |
|--|--|--------------------------------------|----------------------------------|
|  | % or Mean<br>(s.d.) <sup>a</sup>             | % or Mean<br>(s.d.)                  | % or Mean<br>(s.d.)              |
| <i>Demographic Characteristics<sup>b</sup></i>     |  |                                      |                                  |
| Male, %  | 47.9   | 49.3                                 | 47.9                             |
| Hispanic, %  | 91.7   | 93.6                                 | 91.6                             |
| White, %   | 2.1  | 3.5                                  | 4.3                              |
| <i>Grade level as of 2015-16, %</i>                |  |                                      |                                  |
| 6  | 6.8**  | 13.3***                              | 6.7                              |
| 7  | 6.3***                                       | 26.6***                              | 6.3                              |
| 8  | 26.6   | 21.5                                 | 26.5                             |
| 9  | 29.2***                                      | 17.3***                              | 29.2                             |
| 10   | 10.4   | 12.6                                 | 10.4                             |
| 11   | 20.8   | 8.8***                               | 20.8                             |
| LEP, %   |  |                                      |                                  |
| Current  | 12.0   | 27.0***                              | 12.0                             |
| Past   | 4.7  | 5.4                                  | 4.6                              |
| Never  | 83.3   | 67.6**                               | 83.4                             |
| FRL, %   | 87.5   | 82.6                                 | 87.5                             |
| Special Education Status, %                        | 4.7  | 4.5                                  | 4.7                              |
| <i>Baseline test scores</i>                        |  |                                      |                                  |
| Renaissance STAR Reading, Spring 2014-15           | 42.06<br>(18.55)                             | 37.94 **<br>(18.93)                  | 42.05<br>(3.13)                  |
| Renaissance STAR Math, Spring 2014-15 <sup>c</sup> | 59.20<br>(17.33)                             | 50.60***<br>(18.21)                  | 59.13<br>(2.47)                  |
| STARR Reading, Spring 2014-15 <sup>d</sup>         | 1629.31<br>(139.04)                          | 1597.27*<br>(130.22)                 | 1631.10<br>(18.16)               |

Note. s.d. = standard deviation

<sup>a</sup> Standard deviations for continuous variables are in parentheses.

<sup>b</sup> Demographic variable descriptive analysis used the sample of students who had Renaissance STAR reading scores in spring of SY 2014-15 and fall of SY 2015-16 and no missing data on any of the demographic variables.

<sup>c</sup> Treatment sample size is 181. Comparison group sample size is 6730. The sample size is based on students who had Renaissance STAR math scores in spring of SY 2014-15 and fall of SY 2015-16 and no missing data on any of the demographic variables.

<sup>d</sup> Treatment sample size is 75. Comparison group sample size is 4188. The sample size is based on students in Grades 5-8 who had STAAR reading scores in spring of SY 2014-15 and spring of SY 2015-16 and no missing data on any of the demographic variables.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Table 2. Summer Enrichment Participation Impact on Renaissance STAR Reading**

| Predictors                | Fall 2015<br>(n=6972) |      | Winter 2016<br>(n=5332) |      | Spring 2016<br>(n=6554) |      |
|---------------------------|-----------------------|------|-------------------------|------|-------------------------|------|
|                           | $\beta$               | SE   | $\beta$                 | SE   | $\beta$                 | SE   |
| Intercept                 | 5.65***               | 1.34 | 6.58***                 | 1.51 | 10.52***                | 1.49 |
| Treatment indicator       | 2.03***               | 0.30 | 3.58***                 | 0.32 | 2.91***                 | 0.34 |
| Pretest - Spring 2015     | 0.73***               | 0.01 | 0.68***                 | 0.01 | 0.72***                 | 0.01 |
| Renaissance STAR Reading  |                       |      |                         |      |                         |      |
| Female                    | -0.52                 | 0.24 | 0.12                    | 0.28 | -1.06***                | 0.27 |
| American Indian           | -0.02                 | 1.78 | -0.35                   | 1.87 | 0.40                    | 1.96 |
| Asian                     | 6.06***               | 1.21 | 3.95*                   | 1.62 | 6.64***                 | 1.45 |
| Black                     | -7.23***              | 1.00 | -0.86                   | 1.15 | 2.14                    | 1.07 |
| Hispanic                  | -1.47*                | 0.68 | -0.89                   | 0.87 | 0.66                    | 0.73 |
| Grade level as of 2015-16 |                       |      |                         |      |                         |      |
| 6                         | -2.83***              | 0.64 | -0.01                   | 0.71 | -5.04***                | 0.74 |
| 7                         | 1.49*                 | 0.65 | 2.27**                  | 0.71 | -0.11                   | 0.76 |
| 8                         | 0.90                  | 0.46 | 1.82**                  | 0.53 | -1.55**                 | 0.57 |
| 9                         | 1.23**                | 0.45 | 3.83***                 | 0.52 | -1.29*                  | 0.59 |
| 11                        | 2.53***               | 0.46 | 3.11***                 | 0.64 | 0.42                    | 0.56 |
| LEP                       |                       |      |                         |      |                         |      |
| Current                   | -2.83***              | 0.67 | -2.78***                | 0.71 | -0.71                   | 0.75 |
| Never                     | 2.56***               | 0.58 | 1.87**                  | 0.60 | 1.89**                  | 0.65 |
| Non-FRL                   | 2.03***               | 0.38 | 1.53**                  | 0.46 | 1.73***                 | 0.43 |
| Non-Special Education     | 3.31***               | 0.60 | 5.32***                 | 0.63 | 2.42**                  | 0.65 |
| Students                  |                       |      |                         |      |                         |      |

Note.  $\beta$  is the coefficient associated with the predictor from propensity score weighted HLM; SE = standard error.

White, 9<sup>th</sup> grade, and past LEP designation are the omitted dummy variables for race/ethnicity, grade, and LEP status, respectively.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Table 3. Summer Enrichment Participation Impact on Spring 2016 STAAR Reading, n=4249**

| <b>Predictors</b>                   | <b><math>\beta</math></b> | <b>SE</b> |
|-------------------------------------|---------------------------|-----------|
| Intercept                           | 652.35                    | 14006.00  |
| Treatment indicator                 | 24.75***                  | 3.97      |
| Pretest - Spring 2015 STAAR Reading | 0.60***                   | 0.01      |
| Female                              | 13.63***                  | 2.50      |
| White                               | -0.08                     | 5.75      |
| <i>Grade level as of 2015-16</i>    |                           |           |
| 6                                   | 1.38                      | 14006.00  |
| 7                                   | 29.42                     | 14006.00  |
| 8                                   | 35.70                     | 14006.00  |
| <i>LEP</i>                          |                           |           |
| Current                             | -65.35***                 | 7.31      |
| Never                               | -40.60***                 | 6.47      |
| Non-FRL                             | -17.47***                 | 3.82      |
| Non-Special Education Students      | 65.26***                  | 4.34      |

*Note.*  $\beta$  is the coefficient associated with the predictor from propensity score weighted HLM; SE = standard error. 8<sup>th</sup> grade and past LEP designation are the omitted dummy variables for grade and LEP status, respectively.

The sample size was too small to include the same race/ethnicity variables as those in the Renaissance STAR models; race/ethnicity was simplified to White/non-White.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Table 4. Summer Enrichment Participation Impact on Fall 2015 Renaissance STAR Math, n=6911**

| Predictors                                     | Fall 2015<br>(n=6911) |         | Winter 2016<br>(n=6219) |         | Spring 2016<br>(n=6222) |         |
|--|-----------------------|---------|-------------------------|---------|-------------------------|---------|
|  | $\beta$               | SE      | $\beta$                 | SE      | $\beta$                 | SE      |
| Intercept                                      | 19.47**<br>*          | 1.42    | 20.78**<br>*            | 1.52    | 18.52**<br>*            | 1.55    |
| Treatment indicator                            | 1.53***               | 0.28    | 4.46***                 | 0.29    | 2.28***                 | 0.33    |
| Pretest - Spring 2015<br>Renaissance STAR Math | 0.61***               | 0.01    | 0.55***                 | 0.01    | 0.60***                 | 0.01    |
| Female   | -0.14                 | 0.24    | -0.95**                 | 0.25    | -0.25                   | 0.28    |
| American Indian                                | -0.60                 | 1102.81 | 4.03                    | 1182.02 | 4.58                    | 1300.00 |
| Asian  | 0.67                  | 1.37    | 7.53***                 | 1.48    | 17.05**<br>*            | 1.97    |
| Black  | -<br>4.02***          | 1.05    | 2.83**                  | 1.03    | 3.21**                  | 1.07    |
| Hispanic                                       | -1.76*                | 0.80    | 1.59                    | 0.86    | 4.22***                 | 0.89    |
| Grade level as of 2015-16                      |                       |         |                         |         |                         |         |
| 6  | -<br>3.72***          | 0.89    | 5.11***                 | 0.66    | 4.01***                 | 0.73    |
| 7  | -<br>4.58***          | 0.64    | 0.90                    | 0.67    | -1.02                   | 0.75    |
| 8  | -<br>3.17***          | 0.45    | 0.13                    | 0.48    | -2.12***                | 0.56    |
| 9  | 1.09*                 | 0.43    | 2.51***                 | 0.47    | -0.37                   | 0.57    |
| 11   | -<br>2.32***          | 0.44    | -1.59**                 | 0.49    | -2.68***                | 0.55    |
| LEP  |                       |         |                         |         |                         |         |
| Current  | -<br>3.74***          | 0.63    | -1.61*                  | 0.69    | -1.34                   | 0.75    |
| Never  | -1.71**               | 0.56    | -1.41*                  | 0.60    | 1.40*                   | 0.66    |
| Non-FRL  | -0.57                 | 0.36    | 0.09                    | 0.40    | 0.48                    | 0.43    |
| Non-Special Education<br>Students              | 9.38***               | 0.69    | 6.72***                 | 0.63    | 1.89*                   | 0.66    |

Note.  $\beta$  is the coefficient associated with the predictor from propensity score weighted HLM; SE = standard error.

White, 9<sup>th</sup> grade, and past LEP designation are the omitted dummy variables for race/ethnicity, grade, and LEP status, respectively.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



**Table 5. Effect of Summer Enrichment Program Participation on Academic Achievement**

| Outcomes   | Treatment |         |        | Weighted comparison |         |       | $\beta$  | SE   | Effect size |
|--|-----------|---------|--------|---------------------|---------|-------|----------|------|-------------|
|  | n         | Mean    | s.d.   | n                   | Mean    | s.d.  |          |      |             |
| Fall 2015<br>Renaissance<br>STAR<br>Reading<br>NCE scores      | 192       | 42.85   | 17.94  | 6780                | 41.83   | 3.08  | 2.03***  | 0.30 | 0.11        |
| Winter<br>2015<br>Renaissance<br>STAR<br>Reading<br>NCE scores | 163       | 46.10   | 15.66  | 5169                | 42.62   | 3.19  | 3.58***  | 0.32 | 0.23        |
| Spring 2016<br>Renaissance<br>STAR<br>Reading<br>NCE scores    | 171       | 47.78   | 16.76  | 6383                | 43.70   | 3.03  | 2.91***  | 0.34 | 0.17        |
| Fall 2015<br>Renaissance<br>STAR Math<br>NCE scores            | 181       | 61.04   | 15.65  | 6730                | 59.15   | 2.45  | 1.53***  | 0.28 | 0.10        |
| Winter<br>2015<br>Renaissance<br>STAR Math<br>NCE scores       | 190       | 64.39   | 13.65  | 6031                | 60.10   | 2.67  | 4.46***  | 0.29 | 0.33        |
| Spring 2016<br>Renaissance<br>STAR Math<br>NCE scores          | 169       | 61.91   | 15.38  | 6055                | 59.94   | 2.59  | 2.28***  | 0.33 | 0.15        |
| Spring 2016<br>STAAR<br>reading<br>scale<br>scores             | 75        | 1703.81 | 137.47 | 4188                | 1688.11 | 17.52 | 24.75*** | 3.97 | 0.18        |

*Note.* NCE=normal curve equivalent; n=sample size; s.d.=standard deviation;  $\beta$  is the coefficient associated with the treatment indicator (i.e., summer enrichment participation) from propensity score weighted HLM; SE = standard error.

Results come from two-level propensity score weighted hierarchical models where students were nested in schools. HLMs control for baseline student demographic characteristics and the baseline score on the same assessment. Effect size is calculated as the HLM estimated difference in outcome between treatment and comparison groups, divided by the standard deviation in the treated group (Stuart, Lee, & Leacy, 2013).

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$