Impact Evaluation of Imagine Español® in a Large Southwest School District

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Abstract

This study evaluated the impact of Imagine Español on Pre-K students' Spanish language acquisition in a large Texas school district during the 2020–2021 school year. Using a quasi-experimental design with propensity score matching to create baseline-equivalent treatment and control groups, the analysis compared outcomes on the CIRCLE Progress Monitoring System in Spanish between students who used Imagine Español and those who did not. Results demonstrated that program participation was associated with statistically significant gains in overall Spanish language performance, with users scoring over 16 points higher than matched non-users (Hedge's g = .25). Similar positive effects were observed in the rapid letter subdomain, with a 4.60-point advantage (Hedge's g = .27). Findings were consistent across alternative, more restrictive matching procedures. These results provide evidence that Imagine Español supports measurable improvements in early Spanish language proficiency.

Introduction

Research in cognitive science shows that early bilingualism has many benefits for children including enhanced brain plasticity and increased language processing skills (Petitto et al., 2012), as well as improved working memory, inhibitory control, and other executive functioning skills (Sandhofer & Uchikoshi, 2013). Given the importance of such skills, early opportunities to develop bilingualism may prove to be highly value for many children.

Digital learning tools can be a valuable way to support students in language acquisition (Sharifi et al., 2018). Imagine Español by Imagine Learning is a digital supplemental Spanish language solution designed to support Pre-Kindergarten through elementary students of diverse backgrounds. The program provides adaptive and developmentally appropriate instruction that focuses on building students' conceptual understanding of Spanish language domains. As such, students who utilize Imagine Español are expected to improve and accelerate their Spanish language proficiency.

This study aimed to evaluate the efficacy of Imagine Español by addressing the research question: how does participation in Imagine Español impact Pre-Kindergarten student achievement of Spanish language acquisition and proficiency? To accomplish this, Imagine Learning partnered with a large, Southwest school district which implemented Imagine Español across multiple schools with the intent to improve student Spanish language performance. Reported study results demonstrate how this program positively impacted students' CIRCLE Progress Monitoring System in Spanish performance by comparing the performance of Imagine Español students to a highly similar group of students who did not use the Imagine Español program.

Methods

POPULATION

During the 2020–2021 school year, Imagine Español was made available to Pre-K students in a large Texas district. A total of 123 schools enrolled students who used the Imagine Español program for more than zero minutes during the school year. Within 48 of these schools, all Pre-K students (n = 992) were users of the Imagine Español program. The remaining 75 schools had a mix of Pre-K program users and non-users. Ultimately, a total of 554 students did not use the Imagine Español program while a total of 3,347 students were program users.

RESEARCH DESIGN

This study was conducted retrospectively using data from the 2020–2021 school year. It evaluated the difference in Spanish language acquisition between treatment (users of Imagine Español) and control (non-users of Imagine Español) students. The treatment group was comprised of students who logged any usage in the Imagine Español program during

the 2020–2021 school year, whereas the control group included all students who did not. Assignment to the treatment and control groups was not random, so this study is a quasi-experimental design, and statistical procedures were used to ensure baseline equivalence of the treatment and control samples. Since use of Imagine Español in 75 of the 123 participating schools was determined for individual students (rather than for entire classrooms or schools), statistical corrections for clustering across the full study sample were not required.

MEASURES

Multiple data sources were compiled to describe students, their performance, and their work in Imagine Español. Student Spanish language proficiency outcomes were determined using a standardized progress monitoring assessment. Student demographic data were collected to provide additional information on student characteristics that may impact measures of learning outcomes. Data from the Imagine Español program were incorporated to evaluate student engagement. These data sources are reviewed in more detail below.

Spanish Language Proficiency. Students' Spanish language proficiency was determined using the CIRCLE Progress Monitoring System in Spanish. CIRCLE scores were obtained for students who completed the assessment in Fall 2020 and Spring 2021. The Fall CIRCLE assessment is administered from mid-September to mid-October, and the Spring CIRCLE assessment is administered from late-April to late-May. Fall 2020 scores were used to establish baseline equivalence between study groups, and Spring 2021 scores were used to estimate the effect of Imagine Español on Spanish language proficiency.

Student Demographics. Information was collected on individual student demographic characteristics including grade level, gender, race/ethnicity, English language learner status, special education status, and region within the school district.

Imagine Español Usage. Program usage data was also obtained to determine students' engagement and progress in Imagine Español. These data included the total minutes students spent in the program and the number of lessons students completed.

ANALYTICAL SAMPLE

To ensure that the baseline characteristics of treatment and control students used in analyses were comparable, 1:1 nearest neighbor propensity score matching without replacement, with a caliper set to 0.1, was used to create a statistically equivalent analytical sample.[1] Control students were matched to treatment students based on their Fall 2020 CIRCLE Progress Monitoring in Spanish assessment scores, region[2], and all demographic information available:race/ethnicity, gender, English language learner status, special education status, economic disadvantage status, and if they were designated at-risk of dropping out of school[3].

[1]Propensity score matching was executed using the matchit function in R's MatchIt package.
[2]Schools are clustered under an "Office" of the district (i.e., ESO1 = Elementary Schools Office 1). We refer to these as "region."
[3]There are fifteen indicators delineated in Texas Education Code §29.081 and redefined by Senate Bill 702. This variable is correlated with a student's English language learner status.

Exact matching was done for the Fall 2020 CIRCLE Progress Monitoring in Spanish overall score. The resulting analytical sample included 434 users of Imagine Español and 434 non-users. **Table 1** below describes the characteristics of the sample. To ensure that the results of the analyses were not sensitive to the final analytic sample chosen, a second analytic sample was made that required exact matches on all characteristics listed above. Further details of this sample and the resulting analyses can be found in **Appendix B**.

Table 1: Student Characteristics of the Analytical Sample

| Group	Comparison Students	Imagine Español Users	*p*-value	Standardized Mean Difference (SMD)
n	434	434		
Average (SD) Fall 2021 Circle Literacy: Spanish Raw Score	30.16 (30.22)	30.16 (30.22)	.999	<.001
Race / Ethnicity			.293	.131
African American or Black	3	6		
Hispanic	429	422		
Two or More	1	1		
White (non-Hispanic)	1	5		
Gender			.587	.041
Female	216	225		
Male	218	209		
English Language Learner			.999	<.001
Not ELL	22	23		
English Language Learner	412	411		
Special Education			.602	.053
Not SPED	425	428		
Special Education	9	6		
At Risk Student			.999	.068
Not At Risk	0	1		
At Risk Student	434	433		
Region			.684	.103
Achieve 180	6	12		
ESO1	71	71		
ESO2	93	96		
ESO3	259	251		
MSO	5	4		

ANALYTICAL APPROACH

Multiple linear regression was used to evaluate the differences in Spring 2021 CIRCLE Progress Monitoring in Spanish assessments between Imagine Español users and non-users, controlling for Fall 2020 CIRCLE Progress Monitoring in Spanish assessments score and other covariates (including gender, race/ethnicity, SPED classification, at-risk classification, economic disadvantage status, and region). An indicator of whether a student was a control or treatment student was included in the regression as the primary predictor variable. Using multiple linear regressions after propensity score matching ensured that any remaining differences in the underlying treatment and control samples were controlled for by the regression model, effectively isolating the impact of Imagine Español.

Results

IMAGINE ESPAÑOL USAGE

Matched treatment students spent an average of 10.5 hours (with a median of 6) in Imagine Español and completed an average of 24.3 lessons (with a median of 15). See **Figures 1** and **2** for a distribution of hours and lessons completed.

Figure 1. Distribution of Hours Spent
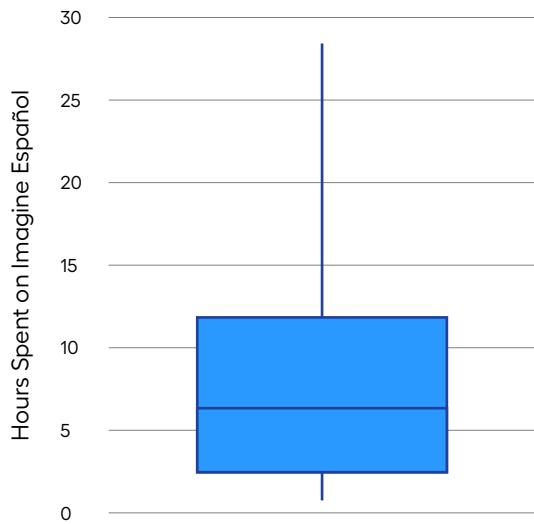
Figure 2. Distribution of Lessons Completed
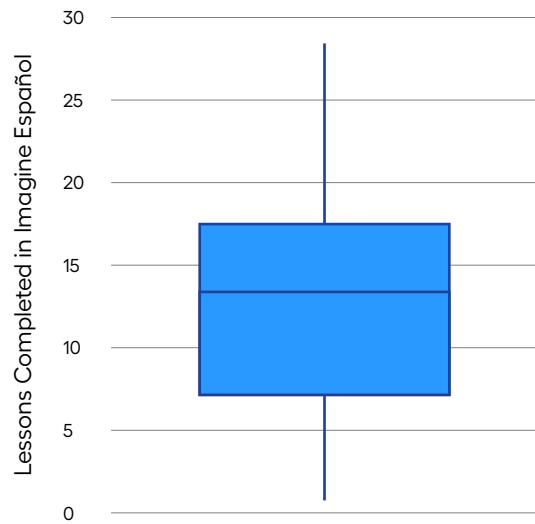
Note: Outliers that fall above 1.5 times the interquartile range are not included in this figure to ensure readability. The global maximum hours spent in Imagine Español is 76.8 hours. The global maximum lessons completed in Imagine Español is 101 lessons.

PROGRAM IMPACT ON STUDENT ACHIEVEMENT

The CIRCLE Progress Monitoring in Spanish assessment includes an overall score as well as scores for four subdomains: rapid letter, rapid vocabulary, letter sounds, and phonics. In this section, results are shared on the overall scores and rapid letter subdomain using the matching procedure described above. For transparency, the results for the rapid vocabulary, letter sounds, and phonics subdomains are shared in Appendix A as the matching procedure on these subdomains resulted in extremely small sample sizes.

Overall, use of Imagine Español was found to generate a positive and statistically significant impact on students' Spanish language performance. Specifically, students who used Imagine Español (n = 434) scored an average of 16.41 overall points higher on the Spring 2021 CIRCLE Progress Monitoring in Spanish assessment than otherwise similar non-user students (n = 434), B = 16.41, $t(855)$ = 4.16, p <.001. Program usage and the other covariates in the model accounted for 21% of the variance found in Spring 2021 scores, R^2 = .212, $F(12, 855)$ = 20.54, p < .001. The Hedge's g effect size of Imagine Español is .25. The covariate-adjusted mean Spring 2021 score was 125.47 for Imagine Español users and 109.06 for non-users. **Table 2** summarizes the results of the multiple linear regression.

Table 2: Overall Impact of Imagine Español on Spring 2021 CIRCLE Progress Monitoring in Spanish Scores

Coefficient	Estimate	Standard Error	*p*-value
Intercept	30.32	24.98	.225
Imagine Español User Indicator	16.41	3.94	<.001
Fall Overall CIRCLE Score	.91	.07	<.001
Male Indicator	1.92	3.97	.630
Race/Ethnicity Indicator			
Hispanic	26.07	22.21	.241
Multi-Ethnic	-7.85	46.06	.864
Other	73.44	32.50	.024
English Language Learner	21.90	10.08	.030
Region			
ESO 1	23.55	15.18	.121
ESO 2	4.92	14.87	.741
ESO 3	18.37	14.49	.205
MSO	-6.82	24.31	.779
SPED Classification	16.70	15.19	.272

When examining the rapid letter subdomain, use of Imagine Español was found to generate a positive and statistically significant impact on students' Spanish language performance. Specifically, students who used Imagine Español (n = 462) scored an average of 4.60 points higher on the rapid letter subdomain of the Spring 2021 CIRCLE Progress Monitoring in

Spanish assessment than otherwise similar non-user students (n = 462), B = 4.60, $t(908)$ = 4.24, p <.001. Program usage and the other covariates in the model accounted for 13% of the variance found in Spring 2021 scores, R^2 = .129, $F(15, 908)$ = 10.13, $p < .001$. The Hedge's g effect size of Imagine Español is 0.27. The covariate-adjusted mean Spring 2021 rapid letter subdomain score was 14.9 for Imagine Español users and 10.3 for non-users. **Table 3** summarizes the results of the multiple linear regression.

Table 3: Impact of Imagine Español on Spring 2021 CIRCLE Progress Monitoring in Spanish Rapid Letter Subdomain Scores

Coefficient	Estimate	Standard Error	*p*-value
Intercept	6.21	4.70	.187
Imagine Español User Indicator	4.60	1.08	<.001
Fall Overall CIRCLE Score	.73	.08	<.001
Male Indicator	.59	1.08	.581
Race/Ethnicity Indicator			
American Indian or Alaska Native	.646	11.90	.957
Asian	9.60	12.20	.432
Hispanic	3.84	4.11	.351
Multi-Ethnic	-17.44	16.52	.291
Other	3.32	5.50	.546
English Language Learner	6.39	1.94	.001
Region			
ESO 1	4.05	2.94	.169
ESO 2	2.67	2.96	.366
ESO 3	4.65	2.69	.084
MSO	.43	4.75	.928
Unknown	-13.57	7.63	.075
SPED Classification	-3.39	3.03	.264

Conclusion

This study provides evidence of the efficacy of Imagine Español on student Spanish language achievement for students in Pre-K by comparing students who used Imagine Español with those who did not during the 2020–2021 school year. Results show that students who used Imagine Español scored over 16 points higher on the Spring 2021 administration of the CIRCLE Progress Monitoring in Spanish assessment than did similar comparison students. This difference was statistically significant. Thus, this study provides evidence that the use of Imagine Español supports students' Spanish language achievement.

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Appendix A

For the rapid vocabulary, letter sounds, and phonics subdomains, the original matching procedure described in the main body of the report was used to create new sample sizes of matched students for each subdomain. This yielded small sample sizes. These sample sizes for users and non-users were 11 for rapid vocabulary, 9 for letter sounds, and 13 for phonics. For transparency, the results for the multiple linear regressions are shared in **Tables A1**, **A2**, and **A3**.

Table A1: Impact of Imagine Español on Spring 2021 CIRCLE Progress Monitoring in Spanish Rapid Vocabulary Subdomain Scores

Coefficient	Estimate	Standard Error	*p*-value
Intercept	6.50	7.69	.410
Imagine Español User Indicator	.21	3.24	.949
Fall Overall CIRCLE Score	.89	.31	.011
Male Indicator	-2.61	4.13	.537
English Language Learner	.84	4.12	.841
Region			
ESO 3	-.52	7.31	.944

Table A2: Impact of Imagine Español on Spring 2021 CIRCLE Progress Monitoring in Spanish Letter Sounds Subdomain Scores

Coefficient	Estimate	Standard Error	*p*-value
Intercept	34.12	14.24	.034
Imagine Español User Indicator	14.08	7.67	.091
Fall Overall CIRCLE Score	-2.46	2.87	.410
Male Indicator	-3.31	8.22	.694
Region			
ESO 3	-22.37	12.88	.108
SPED Classification	-32.71	13.70	.034

Table A3: Impact of Imagine Español on Spring 2021 CIRCLE Progress Monitoring in Spanish Phonics Subdomain Scores

Coefficient	Estimate	Standard Error	*p*-value
Intercept	3.43	1.95	.094
Imagine Español User Indicator	.85	.67	.219
Fall Overall CIRCLE Score	-.07	.30	.818
Male Indicator	-.99	.91	.291
Region			
ESO 1	2.92	1.67	.097
ESO 3	.57	1.36	.679

Appendix B

To ensure that observed results were not sensitive to the matching process used to select the analytical sample, a second analytical sample was created using a different, more restrictive procedure. Rather than using propensity score matching, treatment students were matched to control students if they exactly matched on Fall 2020 CIRCLE Progress Monitoring in Spanish score, region, race/ethnicity, gender, English language learner status, special education status, economic disadvantage status, and if they were designated at-risk of dropping out of school. With this more restrictive matching procedure, matches could not be identified for some treatment students. These treatment students were dropped from the analytical sample. This process resulted in a sample with 412 treatment (Imagine Español user) students and 412 control (non-user) students; **Table B1** demonstrates the equivalence of the samples.

Table B1: Baseline Equivalence of Exact Matched Sample

Group	Comparison Students	Imagine Español Users	p-value	Standardized Mean Difference (SMD)
n	412	412		
Average (SD) Fall 2021 Circle Literacy: Spanish Raw Score	29.04 (28.74)	29.04 (28.74)	.999	<.001
Race / Ethnicity			.999	<.001
African American or Black	1	1		
Asian	0	0		
Hispanic	411	411		
Two or More	0	0		
White (non-Hispanic)	0	0		
Gender			.999	<.001
Female	206	206		
Male	206	206		
English Language Learner			.999	<.001
Not ELL	14	14		
English Language Learner	398	398		
Special Education			.999	<.001
Not SPED	407	407		
Special Education	5	5		
At Risk Student				
Not At Risk	0	0	NA	<.001
At Risk Student	412	412	NA	<.001
Region			.999	<.001
Achieve 180	3	3		
ESO1	65	65		
ESO2	86	86		
ESO3	255	255		
MSO	3	3		

Analyses were similarly conducted on CIRCLE Progress Monitoring in Spanish assessment overall scores and the rapid letter subdomain using this exact matching procedure. For overall score, the results of the analyses are largely the same as the analytical sample from the original matching procedure. In this more restrictive sample, students who used Imagine Español (n = 412) scored statistically significantly (M = 14.8 points) higher on the Spring 2021 CIRCLE Progress Monitoring in Spanish assessment overall score than students who did not use Imagine Español (n = 412), B = 14.8, $t(813)$ = 3.62, $p < .001$. Program usage and the other covariates in the model accounted for 21% of the variance found in Spring 2021 scores, R^2 = .206, $F(10,813)$ = 22.34, $p < .001$. The Hedge's g effect size of Imagine Español program usage is .23. The covariate-adjusted mean Spring 2021 score was 98.2 for Imagine Español users and 83.4 for non-users. **Table B2** summarizes the results of the multiple linear regression.

Table B2: Impact of Imagine Español on Exact Matched Sample Spring 2021 CIRCLE Progress Monitoring in Spanish Overall Score

Coefficient	Estimate	Standard Error	p-value
Intercept	-11.49	48.20	.812
Imagine Español User Indicator	14.72	4.06	<.001
Fall Overall CIRCLE Score	.95	.07	<.001
Male Indicator	2.37	4.12	.565
Race/Ethnicity Indicator			
Hispanic	28.46	43.2	.510
English Language Learner	22.86	11.81	.053
Region			
ESO1	62.97	24.70	.011
ESO2	42.99	24.54	.080
ESO3	56.37	24.33	.021
MSO	27.78	34.33	.419
SPED Classification	5.25	18.80	.780

For the rapid letter subdomain on the exact matched students, use of Imagine Español was found to generate a positive and statistically significant impact on students' Spanish language performance. Specifically, students who used Imagine Español (n = 447) scored an average of 3.40 points higher on the rapid letter subdomain of the Spring 2021 CIRCLE Progress Monitoring in Spanish assessment than otherwise similar non-user students (n = 447), B = 3.40, $t(881)$ = 3.20, $p < .01$. Program usage and the other covariates in the model accounted for 13% of the variance found in Spring 2021 scores, R^2 = .133, $F(12, 881)$ = 12.39, $p < .001$. The Hedge's g effect size of Imagine Español is 0.20. The covariate-adjusted mean Spring 2021 rapid letter subdomain score was 15.4 for Imagine Español users and 12.0 for non-users. **Table B3** summarizes the results of the multiple linear regression.

Table B3: Impact of Imagine Español on Exact Matched Sample Spring 2021 CIRCLE Progress Monitoring in Spanish Rapid Letter Subdomain Scores

Coefficient	Estimate	Standard Error	p-value
Intercept	1.15	7.51	.878
Imagine Español User Indicator	3.40	1.07	<.01
Fall Overall CIRCLE Score	.76	.09	<.001
Male Indicator	-.10	1.08	.926
Race/Ethnicity Indicator			
Hispanic	7.22	6.90	.296
White	8.54	10.38	.411
English Language Learner	4.40	2.02	.030
Region			
ESO1	8.38	3.69	.023
ESO2	5.37	3.60	.137
ESO3	9.17	3.49	.009
MSO	-.48	5.10	.925
Unknown	-8.67	8.68	.318
SPED Classification	-3.08	2.88	.286

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