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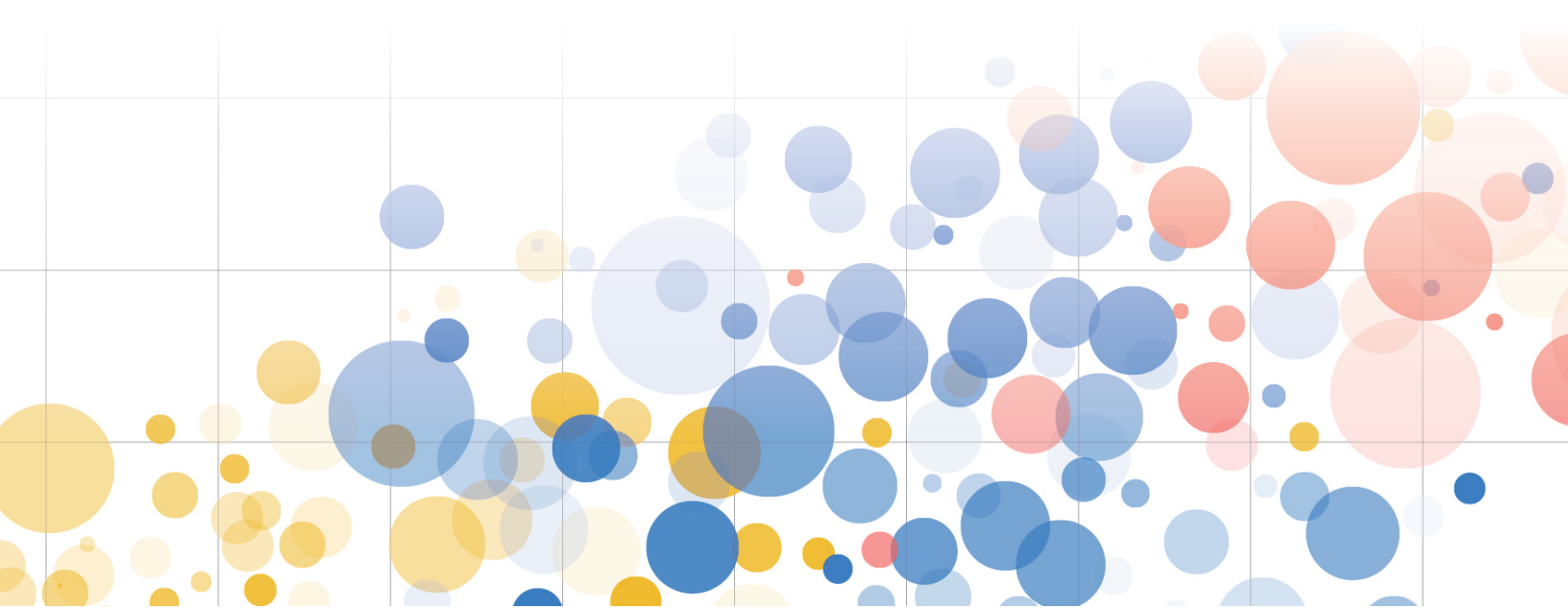
The Effect of Dual Language Immersion Programs on Student Outcomes

May 2021

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DISCLAIMER: The results in this policy brief are preliminary and have not undergone the peer review process. All opinions or views expressed herein are those of the authors and do not necessarily represent the opinions or views of any school district partner.



HIGHLIGHTS

- We study the impact of access to early-grade Dual Language Immersion (DLI) programs using data from five cohorts of DLI admission lotteries across 10 DLI programs in two metro-Atlanta school districts.
- Students whose families applied for a DLI program between school year (SY) 2014-15 and SY 2018-19 were less likely to live in households experiencing low income or ever be classified as English Learners relative to the average demographic characteristics of the districts' kindergarten cohorts.
- Leveraging randomized offers for DLI program enrollment across 10 programs, on average, we find evidence of math and reading test score gains in elementary grades among students who win the lottery and receive an offer to enroll in a DLI program relative to those who apply but do not gain access to the program.
- On average, 88 percent of DLI applicants are native English speakers. Among this subset of students, randomized access to a DLI program leads to an increase of up to 0.1 standard deviations in math test scores. We find positive, albeit statistically insignificant, differences in reading scores.

MOTIVATION AND PRIOR RESEARCH

Dual Language Immersion (DLI) programs are schools or classrooms within schools that educate students in two languages: English and a target language. In recent years, the number of DLI programs has increased rapidly, and it is estimated there are over 2,000 programs across 35 states (Maxwell, 2012; Boyle et al., 2015).¹ However, evidence on the efficacy of these programs is relatively sparse and concentrated on programs in a handful of states.² Due to significant variation in program design and implementation (Boyle et al., 2015), there are limits to drawing policy implications from the existing literature.

School districts throughout the United States have instituted DLI programs based on the promise of promoting bilingualism, biliteracy, and global awareness (Boyle et al., 2015). Parents may also enroll their children in DLI programs because of widely-known cognitive neuroscience research showing strong positive correlations between bilingualism and enhanced cognitive processes.³ Because of these strong links, parents who enroll their children in DLI programs may also have an expectation that participation will lead to enhanced academic achievement for their children (Parkes, 2008; Ee, 2018).⁴ However, it is unclear whether cognitive

¹ These estimates likely undercount recent expansions in North Carolina, Utah, Delaware, Georgia, and New York City.

² Most recent studies explore the impact of DLI programs in California (e.g., Jepsen, 2010), North Carolina (e.g., Bibler, 2020), and Oregon (e.g., Steele et al., 2017).

³ Research shows that bilingualism is strongly associated with enhanced executive function (Barac et al., 2014), working memory (Grundy & Timmer, 2017; Morales et al., 2013), attention control (Adesope et al., 2010), and task switching (Wiseheart et al., 2016).

⁴ In a survey of more than 450 parents with children enrolled in DLI education, "better academic success" was the second most common reason for choosing DLI among parents whose first language did not match the program's target language. The first reason was to develop bilingual skills (Ee, 2018).

gains associated with bilingualism translate to second language acquisition in a school setting. Even in a controlled laboratory environment, there are mixed results on the relationship between bilingualism and academic achievement, with language of instruction and language proficiency impacting performance (Barac et al., 2014).⁵

At a time when DLI programs are expanding, emerging evidence on the impact of DLI programs on test scores complements existing research on bilingualism and provides more direct evidence on the academic benefits of DLI programs. A recent study leveraging randomized access to oversubscribed DLI programs found positive effects on reading among fifth and eighth graders (Steele et al., 2017). There are also mixed findings on math achievement, ranging from large and positive impacts (Bibler, 2020) to no change in test scores (Steele et al., 2017).

Extant studies also find mixed results on the academic impact of DLI programs by students' English Learner (EL) classification (Bibler, 2020; Jepsen, 2010; Chin et al., 2013). While some studies find that DLI can reduce the time to reclassification out of EL status and improve English language arts (ELA) achievement (Bibler, 2020; Steele et al., 2017), others find negative effects, specifically in early grades (Jepsen, 2010).

For this study, we partnered with two metro-Atlanta school districts to conduct a rigorous evaluation of the impact of early-grade participation in DLI programs on academic achievement. Specifically, we estimate the impact of access to DLI programs on student

achievement in reading and math through grade 5. To our knowledge, this is among the few studies to present evidence focused on early-grade DLI programs and achievement,⁶ specifically among DLI programs that serve mostly native English speakers.

DUAL LANGUAGE IMMERSION PROGRAMS IN GEORGIA

In line with the trend across the United States, DLI programs in Georgia have proliferated to include 66 programs that reach across 14 school districts as of school year (SY) 2018-19. According to the Georgia Department of Education, 6,713 students were enrolled in a DLI program in SY 2018-19. The main goal of these programs is to support bilingual proficiency in English and the target language without sacrificing academic achievement. The programs are also often tied to state goals to develop a workforce prepared to interact in a global economy.⁷

As first implemented, DLI programs in Georgia were targeted as one-way models instructing primarily native English-speakers in both the target language and English. However, starting in 2015, DLI programs became a state-approved English to Speakers of Other Languages (ESOL) delivery model. As a result, more English Learners are now enrolling in DLI, thereby transforming some of these programs into two-way models where native speakers of English and the target language are taught in the same classroom.

⁵ For example, studies have found similar performance between monolingual and bilingual children in tasks such as letter identification, word reading, and reading comprehension (Lesaux & Siegel, 2003; Kang, 2012).

⁶ Jepsen (2010) studies the impact of bilingual education on ELs' English proficiency in grades 1-5.

⁷ See gadoe.org/Curriculum-Instruction-and-Assessment/Curriculum-and-Instruction/Pages/Dual-Immersion-Language-Programs-in-Georgia.aspx

DLI programs in traditional public schools use a 50:50 model where instruction in the target language and English is split evenly during the school day. Specifically, the target language is used for instruction in math, science, target-language literacy, and sometimes social studies. English is used to teach ELA and electives such as music, art, and physical education.⁸ Each classroom is supported by two teachers where one focuses on English instruction and the other instructs exclusively in the target language.

Participating in a DLI program is voluntary, and interested families must apply on behalf of their student months in advance to be considered for admission. Applicants to the studied programs are limited to students entering kindergarten or first grade to increase maximum target language exposure in early grades.⁹ For programs that receive more applicants than they have slots available, the schools determine who is offered admission through randomized lotteries where students who live in the relevant school attendance zone are given priority.¹⁰

RESEARCH QUESTIONS

- 1) What are the demographic characteristics of students who apply to a DLI program, and do they differ from the districtwide average characteristics of students?

- 2) Does access to a DLI program impact student test scores in reading and math?
- 3) Does access to a DLI program have differential effects for native English speakers versus English Learners?

DATA AND METHODOLOGY

We leverage data on random enrollment offers from five kindergarten cohorts across 10 DLI programs in two metro-Atlanta school districts. Specifically, we use data for students whose families applied to at least one DLI program in kindergarten or first grade and were subject to an enrollment lottery from SY 2014-15 to SY 2018-19.¹¹ Our analysis sample is limited to schools and years subject to an enrollment lottery.¹²

The number of DLI-hosting schools has risen rapidly over time. As shown in Figure 1, the number of oversubscribed DLI programs in the studied districts rose from two DLI-offering schools in SY 2014-15 to nine programs by SY 2017-18. Applications to DLI programs have also increased—nearly sevenfold over the study period.¹³ In total, there were 1,590 DLI applications subject to a lottery; 904 (57 percent) won the opportunity to enroll in a DLI program.

⁸ Charter schools have flexibility in choosing the distribution between target language and English instruction across subjects and during the school day. As of SY 2018-19, there are five DLI charter schools.

⁹ DLIs are considered a long-term commitment, and it is common for schools to stress that students must remain in the program up to grade 5 to experience the full benefit.

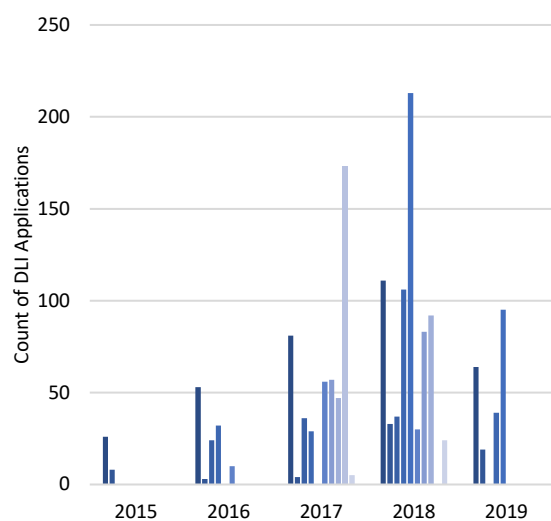
¹⁰ Other priority groups include siblings of DLI students and children of DLI teachers.

¹¹ We omit students in priority groups that are not subject to lotteries, such as siblings of DLI students and children of DLI teachers. Data for DLI lotteries in SY 2018-19 come from only one of the two districts in the study.

¹² A lottery takes place if the number of applications exceeds available seats.

¹³ Nine programs were oversubscribed in SY 2017-18; however, there were 10 programs that held lotteries at least once over the sample period. The number of DLI applicants in SY 2018-19 was lower than SY 2017-18 in part because we have data from only one district in the sample. However, applications across the DLI programs in that district were lower in SY 2018-19.

Figure 1. DLI Lottery Applications by School Year



Notes. Each bar represents a DLI-hosting school. Data are limited to schools and years subject to a lottery. Observations are measured at the application, not applicant, level. The sample excludes students in preference groups, such as siblings of current DLI students and children of DLI teachers. Data for DLI lotteries in SY 2018-19 come from only one of the two districts in the study.

There are three target languages represented in the sample: Spanish, French, and German. In line with the state-level counts, most students apply to Spanish DLI programs (56 percent), followed by French (23 percent) and German (21 percent).

To examine the causal effect of access to a DLI program on academic achievement, we compare test scores of students whose families were equally motivated to apply for DLI programs but faced different opportunities to participate because of a randomized enrollment lottery. In short, we compare test scores for students who applied to the programs and were

offered admission with scores for students who applied to the same program but were not offered a slot.¹⁴ Given the random nature of the lottery, differences in test scores can be causally attributed to differential access to dual language education.

We assess the impact of access to DLI programs by examining differences in early-grade test scores from kindergarten to fifth grade. Specifically, we use data on ITBS scores by grade 2 and MAP scores from kindergarten to grade 5.¹⁵

RESULTS

RESEARCH QUESTION #1

Figure 2 shows differences in demographic characteristics between DLI lottery applicants and the full kindergarten cohorts in both districts. Students whose families chose to apply to a DLI program were 14 percentage points less likely to be eligible for free or reduced-price lunch (FRL)—a measure of economic disadvantage—or to ever be identified as English Learners compared to the full kindergarten cohorts. On average, DLI applicants were also more likely to be Black and less likely to be Asian or Hispanic relative to all kindergarteners. By contrast, the proportion of White applicants mirrored that of the full kindergarten cohorts.

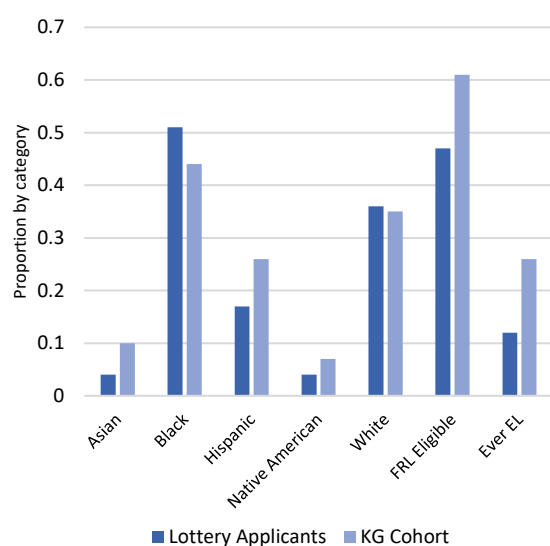
Demographic characteristics also varied significantly across DLI programs. For example, the percentage of applicants who were English Learners ranged from 2 percent to 75 percent—indicative of differences in whether DLI was used as an ESOL model or as an enrichment program for native English speakers. Family income also

¹⁴ We also conduct analyses where we control for demographic characteristics at the time of lottery application. We obtain qualitatively similar results.

¹⁵ All test scores are normalized to have mean 0 and standard deviation 1. ITBS scores are normalized from the Normal Curve Equivalent scores. MAP scores are normalized with respect to the 2015 RIT Scale Norms by grade and subject. The choice of test varies by district.

differed meaningfully across programs with between 13 percent and 95 percent of applicants ever being eligible for FRL.

Figure 2. Demographic Characteristics for DLI Lottery Applicants and Districtwide Cohorts of Students Entering Kindergarten



Notes. Lottery applicants are students who registered for a DLI program and were subject to a lottery. The sample excludes students from preference groups, such as siblings of current DLI students and children of DLI teachers. The entering kindergarten cohorts correspond to students who entered the district in this grade from SY 2014-15 to SY 2018-19.

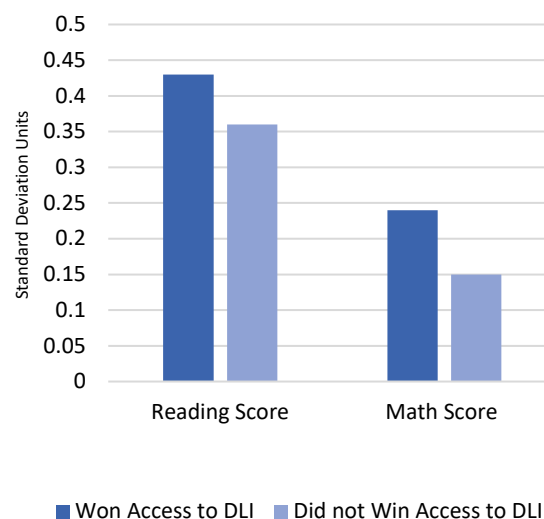
RESEARCH QUESTION #2

We find evidence of test score gains in reading and math among students who won the lottery and were offered a seat in a DLI program relative to those who applied for a lottery but did not win. Specifically, lottery-winning students scored higher in reading and math by 0.07 to 0.11 standard deviations (as shown in Figure 3).¹⁶ We conduct further analyses on the effect of DLI participation using lottery results to generate

¹⁶ Our findings are larger and more consistent across samples for math relative to reading. The magnitude of the estimates varies with the choice of control variables.

random variation in program enrollment. These findings also indicate test score gains among DLI participants; however, results from these analyses were not statistically significant.

Figure 3. Normalized Reading and Math Scores Adjusted for Lottery Strata and Grade, by DLI Lottery Outcome (Grades K-5)



Notes. Test scores are predicted values adjusted for lottery strata and grade fixed effects. All test scores are normalized to have mean 0 and standard deviation 1. ITBS scores are normalized from the Normal Curve Equivalent scores. MAP scores are normalized with respect to the 2015 RIT Scale Norms by grade and subject.

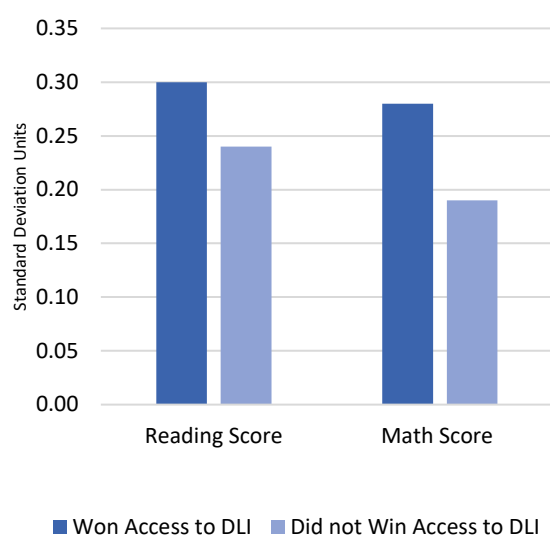
Our findings are consistent with existing studies using DLI lottery enrollment data that document gains in achievement among students who participate in DLI programs (Steele et al., 2017; Bibler, 2020). In addition, our results complement current studies by providing evidence of positive achievement gains in early grades.¹⁷

¹⁷ Subgroup analyses limited to one district show test score losses in math among DLI-eligible students. However, these results are reversed when we estimate the effects of DLI eligibility among the subgroup of non-EL students.

RESEARCH QUESTION #3

In line with our main results, we find test score gains in math among the subgroup of non-EL students. Specifically, as shown in Figure 4, those who win access to a DLI program scored 0.10 standard deviations higher, on average, in math tests. While we estimate a positive reading test score difference between DLI-eligible and ineligible students, our results for the subgroup of non-EL students were not statistically significant.

Figure 4. Normalized Reading and Math Scores Adjusted for Lottery Strata and Grade, by DLI Lottery Outcome (Grades K-5, Subgroup of Non-EL students)



Notes. Test scores are predicted values adjusted for lottery strata and grade fixed effects. All test scores are normalized to have mean 0 and standard deviation 1. ITBS scores are normalized from the Normal Curve Equivalent scores. MAP scores are normalized with respect to the 2015 RIT Scale Norms by grade and subject. The sample excludes students identified as ever ELs.

CONCLUSIONS AND RECOMMENDATIONS

We present evidence on the characteristics of students who participated in a DLI lottery and examine whether there were differences in reading and math test scores by DLI lottery outcome. In summary, DLI lottery applicants were less likely to be Hispanic or Asian or live in low-income households. Further, 88 percent of DLI applicants were non-EL students, making these primarily “one-way” DLI programs.

We examine the effect of DLI programs on academic achievement for students whose families sought out dual language education for their children and participated in an admissions lottery. On average, we find test score gains in reading and math of up to 0.1 standard deviations among students whose families applied for and were offered admission to a DLI program through the lottery process relative to those who applied but were not awarded a seat.

Our findings suggest that, as currently designed, DLI programs are generating benefits for students who are granted access. We recommend the continuation of investment and recruitment efforts into DLI programs in early grades. We also recommend extending the scope of this project, which will allow us to explore the longer-term impact of access to DLI programs.

Lastly, given the relatively low participation by English Learners during the period of study, the benefits to ELs of current DLI programs are unclear. While our results provide important new evidence on the impact of existing (largely “one-way”) DLI programs, the findings may not be applicable to newer DLI programs that employ a two-way model with roughly equal proportions of ELs and native English speakers.

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