UNIVERSITY OF CALIFORNIA,
IRVINE

Evidence-based Instructional Approaches for Raising the Reading Achievement of Latinx Youth

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Education

by

Melina Aurora Pinales

Dissertation Committee:
Distinguished Professor George Farkas, Co-Chair
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2022

DEDICATION

Para

Mi Abuela

Alma Garcia

Mi Luz, Mi Fuerza, Mi Razón

"Do work that matters. Vale la pena."

– Gloria Anzaldúa

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Aurora, M., and Farkas, G. (2022) *Can Paraprofessional Instructional Assistants Raise the Reading Performance of Latino/a First Graders in a Low-Income District?* Manuscript Accepted for Publication in Remedial and Special Education.

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Aurora, M., and Farkas, G. *Implementation features of biliterate paraprofessional instructional assistants in a predominantly Latino and low-income district*.

Aurora, M., and Farkas, G. *Bilingual and dual language instruction throughout elementary school raises the reading performance of Latino students at fifth grade.*

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Melina Aurora Pinales, Can Paraprofessional Instructional Assistants Raise the Reading Performance of Latino/a First Graders? Presentation for District Leaders and School Principals at Santa Ana Unified School District, Spring 2020, Santa Ana, CA

Melina Aurora Pinales and George Farkas, Does attending center-based care prior to kindergarten improve Hispanic children's academic readiness skills? Poster presented at Society for Research in Child Development 2019 Biennial Meeting, Baltimore, MD

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Graduate School Personal Statement Workshop Facilitator September 30, 2017
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"We Are Them" Kindness Workshop Facilitator July 2017
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PROFESSIONAL EXPERIENCE

Santa Ana Early Learning Initiative (SAELI) Member 2018-2019
Santa Ana Unified School District

- Participated and engaged in community-based meetings with members from the

community, including families, school and district leaders, and service providers
- Brainstormed and discussed ongoing projects focusing on the improvement of young children's health and educational outcomes
- Attended Neighborhood Leadership Team Training Meetings where parent leaders from the community planned, designed, and implemented *Wellness Centers* across all schools in the district

RESEARCH INTERESTS

Early Childhood Education Policy
Program Evaluation
Bilingual learners
Research-Practice Partnerships

ABSTRACT OF THE DISSERTATION

Evidence-based Instructional Approaches for Raising the Reading Achievement of Latinx Youth

By

Melina Aurora Pinales

Doctor of Philosophy in Education

University of California, Irvine, 2022

Distinguished Professor George Farkas, Co-Chair

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Latinos comprise a significant portion of the total school enrollment in the U.S., and an increasing share of Latinos are pursuing higher education today. However, Latino students still face many educational barriers, and research has repeatedly demonstrated that Latino children lag their peers in terms of their academic achievement. In addition, reading skills are the foundation of student learning and provide students with the literacy skills necessary for accessing academic material in other subject areas. Thus, in this dissertation, I focus on expanding the evidence base on instructional approaches that target Latino students' early reading outcomes. This two-study dissertation examines the effectiveness of two different instructional approaches that could be implemented in elementary school classrooms to raise the reading achievement of Latino students, many of whom also come from Spanish speaking homes. The first study is based on data collected from a large, urban school district in Southern California where nearly all students are Latino, and many come from low-income backgrounds. The second study utilizes a nationally representative sample of Latino students in the U.S. with over 70% of students within the sample coming from Spanish speaking homes.

Employing a mixed-methodology framework, the first study investigated the impact and effectiveness of a district-implemented Biliterate Instructional Assistant (BIA) program in a predominantly Latino and low-income district. BIAs were paraprofessionals hired by the district for the purpose of providing instructional assistance to first-grade teachers within the lowest performing schools. A quasi-experimental approach was used to assess the impact of the BIA program on students' reading outcomes. Specifically, I used a short comparative interrupted time series (CITS) design to compare the reading test scores of students within BIA schools (n=6) and those in comparison schools (n=5) that were selected to match these schools. Utilizing data across three years (i.e., 2016-2019), I analyzed the school-level trends of BIA and comparison schools prior to the implementation of the program during academic years 2016-17 and 2017-18, and the reading outcomes of both groups after the implementation of the program (AY 2018-19). This analytic approach provided causal estimates of the BIA program on the average school-level reading achievement of students within BIA schools. To complement the school-level results from the CITS analysis, I also assessed the impact of the program on student-level reading outcomes by comparing the reading test scores of students (n=865) within BIA and comparison schools during the implementation year while also controlling for their prior reading achievement and demographic characteristics (i.e., English Learner status, Free/reduced priced lunch status, parent education, and eligibility for Special Education).

Findings from the CITS analysis revealed that the BIA program had a large, positive impact on BIA schools' average reading performance, though this was a marginally significant finding (ES=.825, $p<.10$). This p-value is considered acceptable given the small number of school clusters and considering this was a pilot study. Additionally, findings from the student-level analysis revealed that the BIA program had a significantly positive impact on students'

reading outcomes (ES=.195, $p<.05$), even after controlling for students' demographic characteristics, lending further support to the positive findings from the CITS analysis.

In addition, these quantitative findings were supplemented with qualitative data from BIA classrooms obtained through interviews with first-grade teachers and the BIAs themselves, as well as observational data of their instructional content and delivery and time-log diaries outlining their daily instructional duties and activities. These data were collected to describe and highlight implementation features of the BIA program for the purpose of informing district-leaders of which classroom implementation features appeared most promising in improving students' reading outcomes. Considering each school had discretion in how to implement the BIA program, the amount of time BIAs spent in each first-grade classroom and the primary type of instructional grouping BIAs provided (i.e., 1-1 or 2-1, small group, or large group) varied between BIA classrooms. Thus, these implementation features were calculated and coded for each classroom by triangulating across the interview, observational, and time-log diary data. Then, I used regression analysis to predict BIA classrooms' (n=28) average spring scores during the implementation year while controlling for BIA time, instructional grouping type, the classroom's fall average reading test score, and percent EL.

The classroom-level findings revealed that the amount of time BIAs were in first-grade classrooms, measured in minutes, and the instructional grouping type significantly predicted classrooms' average spring reading performance. For every additional hour BIAs spent in these classrooms, classrooms' average reading scores increased by .459 of a standard deviation ($p<.001$). Additionally, those classrooms that primarily provided supplemental BIA instruction 1-1 or 2-1, as opposed to large group instruction (5 or more students), had significantly higher

average classroom reading scores (b=.634, p<.05), though there were no significant differences between classrooms providing small group (3-4 students) and large group instruction.

Qualitative data further revealed that the range of literacy components covered during instruction, student progress monitoring, communication between teachers and BIAs, and behavior management were implementation features that appeared most salient to classroom reading performance among BIA classrooms.

The second study examined the relationship between bilingual or dual language (DL) instruction provided to a nationally representative sample of Latino students and their reading outcomes at fifth grade. Analyzing data from the Early Childhood Longitudinal Study, 2011 cohort, I investigated the typical patterns of treatment (i.e., bilingual or DL instruction) that students received from kindergarten to fifth grade. I also analyzed which student and school characteristics were most predictive of bilingual instruction at each year using logistic regression. Then, using full information maximum likelihood (FIML) to account for missing data and student fixed effects analysis, I assessed the impact and relationship between bilingual instruction and students' fifth grade reading outcomes by using a series of six dummy variables representing whether a student received bilingual or DL instruction at each year (grades K-5), as well as a continuous variable representing the total number of years students received bilingual instruction from grades K-5.

Findings revealed that only 20% of the total sample received any bilingual or DL instruction throughout elementary school with nearly 4% receiving this instruction every year. Another 7% of students in the sample received bilingual instruction beginning at kindergarten with 1-2% exiting these programs each subsequent year. Additionally, results from the logistic regression revealed that students' linguistic background (i.e., English proficiency scores and

Spanish language use in the home), as well as school characteristics (i.e., whether schools received Title I funds, percent Hispanic, and percent EL) were the most significant predictors of bilingual instruction. Finally, FIML results revealed that with each additional year of bilingual or DL instruction, students scored significantly higher on the reading test at the end of fifth grade (ES=.042, $p<.01$). These findings were supported by student fixed effects analysis which revealed that the total number of years students received bilingual or DL instruction positively predicted their reading scores and this was a marginally significant finding (ES=.04, $p<.10$). Post-hoc analyses revealed that bilingual instruction was particularly most effective when provided during the early grades (K-1st). Future research and implications are discussed.

CHAPTER 1

Introduction

The Every Student Succeeds Act (ESSA) of 2015 holds schools and districts accountable for students' academic progress by mandating that states test all students in math, reading and language arts, and science beginning in third grade to ensure they are making adequate yearly progress (AYP). Schools must also disaggregate state-level test scores for subgroups of students, including Latino students, as well as English Learners (ELs), and those from low-income families and in special education. Meanwhile, as a consequence of housing segregation, among other factors (Orfield, 2013), some schools and districts primarily serve students from a particular ethnic group, often including a significant share of recent immigrants, and thus of students who are classified as ELs.

Furthermore, the percentage of Latina/o students in the U.S. has increased to nearly 27% of the total public-school enrollment (NCES, 2021). However, Latinos still demonstrate many academic disparities across the U.S. education system (Schneider, Martinez, & Owens, 2006). For instance, socioeconomic and racial/ethnic opportunity and achievement gaps between Latino students and their non-Latino peers are present at kindergarten-entry (Reardon & Portilla, 2016), and these gaps tend to persist throughout elementary school and beyond.

As schools remain racially and economically segregated, Latino, immigrant, and other minoritized students may encounter inequitable learning environments due to disparities in school funding, teacher quality, culturally insensitive curricula, and access, or lack thereof, to high-quality preschool (Fuller et al., 2019; Nores & Barnett, 2014). Moreover, schools serving large shares of recent Latino immigrants must be prepared to teach native Spanish speaking students, which provides an instructional challenge for these schools and districts in meeting

state standards, particularly in the early elementary grades when students have not fully acquired foundational English language and literacy skills. This issue is particularly salient for schools and districts serving low-income immigrant residential enclaves, yet it often goes unaddressed in these districts where, instead of providing them with extra resources and assistance, elementary school teachers are expected to simply cope as best they can. The result is that successive cohorts of students are reading below the expected grade level as they move up through the elementary, middle, and high school grades, posing continuing instructional challenges as teachers strive to teach from nationally disseminated curricular materials predicated on the reading levels of white, middle-class, native English speakers.

In this dissertation, I evaluate the effectiveness of two strategies that could be implemented in such districts to improve the academic performance of Latino and Spanish speaking students. The first is hiring paraprofessional instructional assistants to supplement the instruction provided by teachers. This approach serves as a low-cost alternative to reducing the student-to-teacher ratio, particularly in classrooms with larger class sizes and greater percentages of ELs. The second strategy is to provide bilingual or dual language instruction to Latino students beginning in kindergarten to ensure they have access to the academic curriculum while they are still building their English language proficiency skills.

Overview of the Remaining Chapters

Chapter Two

In this chapter, I describe the research setting, study background, and implementation features of the biliterate paraprofessional program (Study One). I discuss the setting of the Santa Ana Unified School District where study one takes place, as well as the demographic characteristics of students within the district and the paraprofessionals delivering instruction. I

also discuss the development of this program, program delivery, paraprofessional training, curriculum, instructional content, and Spanish language use.

Chapter Three

In this chapter, I present Study One where I investigate the impact and effectiveness of biliterate instructional assistants (BIAs) on the reading performance of first graders in selected schools within the Santa Ana Unified School District (SAUSD), which is a predominantly Latino school district with many students also coming from low-income backgrounds and Spanish speaking homes. I employ a quasi-experimental design using three years of data collected by the district from 2016-2019. The sample consisted of first graders (n=865) within 6 schools that received BIAs and 5 comparison schools that were selected to match these schools. Students were nearly all Latino, over 80% classified as ELs, and over 90% received free or reduced priced lunch (FRPL). Estimation procedures included descriptive statistics and multiple linear regressions controlling for prior test scores and demographics, including EL status, FRPL status, parent education level, and eligibility for special education. A short comparative interrupted time-series design was used to assess the school-level impact of BIAs on average school performance by comparing school-level trends of both groups of schools (i.e., BIA and comparison schools) during academic years 2016-17 and 2017-18, prior to the implementation of the program, and school outcomes during the postprogram period (2018-2019). Student-level analysis complemented the school-level analysis to provide further estimates of the impact of BIAs on student outcomes.

A mixed methodological framework (Creswell & Clark, 2018) was also employed to investigate the relationship between various classroom implementation features and average classroom reading performance among those classrooms that received instructional support from

the BIAs. Data sources included interviews with teachers and the BIA themselves, observations of their instructional delivery, and time-log diaries completed by BIAs where they logged their daily instructional activities. The following research questions were addressed:

Research Question 1: What is the school-level impact of Biliterate Instructional Assistants (BIAs) on the reading performance of first graders in selected schools?

Research Question 2: What is the individual-level impact of BIAs on the reading performance of students within these schools?

Research Question 3: Do certain features of program implementation (i.e., group size, amount of time in classrooms, instructional content and delivery, student progress monitoring, behavior management, and communication with teachers) help explain which classrooms made greater and lesser gains in reading during the implementation year?

Chapter Four

In this chapter, I present Study Two where I examine the relationship between bilingual or dual language (DL) instruction and the 5th grade reading outcomes of a nationally representative sample of Latino students. Estimation procedures included descriptive statistics and multiple linear regressions controlling for a range of child-, family-, and school-level variables. First, I present the patterns of treatment (i.e., bilingual/DL instruction from kindergarten to 5th grade). Then, I use logistic regression to model which child, family, and school characteristics were significantly predictive of whether a student received bilingual or DL instruction from kindergarten to fifth grade. Next, I employed full information maximum likelihood (FIML) to estimate the relationship between bilingual or DL instruction from kindergarten to 5th grade and 5th grade reading outcomes using a dosage variable for the total number of years students received native language instruction (range 1-6 years), as well as six

dummy variables (1=bilingual or DL instruction at each year). Then, I complemented this analysis using pooled OLS with student fixed effects to provide causal estimates of the impact of bilingual instruction on Latino student's reading outcomes. Finally, a summary of findings and broader implications are further discussed. The following research questions were addressed:

Research Question 1: What are the patterns of treatment (i.e., bilingual or DL instruction) students received throughout elementary school?

Research Question 2: Which child, family, and school characteristics are significantly predictive of whether a student received bilingual or DL instruction from kindergarten to fifth grade?

Research Question 3: What is the relationship between bilingual or DL instruction from kindergarten to 5th grade and students' 5th grade reading outcomes, controlling for child-, family-, and school-level characteristics?

Research Question 4: What is the impact of bilingual or DL instruction on the reading performance of Latino students?

Chapter Five

In this last chapter, I provide an overview of key findings from this dissertation, and further summarize the larger policy implications of the results from these studies. I also discuss implications for future research.

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Fuller, B., Kim, Y., Galindo, C., Bathia, S., Bridges, M., Duncan, G. J., & Valdivia, I. G. (2019). Worsening School Segregation for Latino Children? *Educational Researcher*, 48(7), 407-420. DOI: 10.3102/0013189X19860814

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CHAPTER 2

Implementation Features of Biliterate Instructional Assistants within a Predominantly Latinx School District

During the 2018-2019 academic year, the Santa Ana Unified School District (SAUSD), a predominantly Latinx and low-income district in Southern California, provided selected elementary schools additional instructional support by hiring approximately 25 part-time teacher assistants who were also biliterate in English and Spanish. The intention behind this decision was to improve the school-level English Language Arts (ELA) performance of six of the lowest-performing schools that were selected based on their fall 2017 ELA performance and growth as determined by tests administered statewide in California. Paraprofessionals, also known as paraeducators, teacher assistants, teacher aides, or as in this study, Biliterate Instructional Assistants (BIAs), were placed in these low-performing schools to assist and supplement the instruction provided by first-grade teachers.

A collaboration with university researchers was sought to obtain more information about the effectiveness of these paraprofessionals. District leaders not only wanted to know the impact paraprofessionals had on student outcomes, but also which implementation features they should reinforce in the coming years. Thus, Study One evaluates the impact and implementation of paraprofessional teacher assistants within the SAUSD where student enrollment was almost completely Latinx and from low-income backgrounds.

Student test score and demographic data collected by the district was used to evaluate the impact paraprofessionals had on the reading outcomes of first graders in selected schools. As previously mentioned, students within these schools were nearly all Latino (98-100%), received free or reduced-priced lunch (84-99%), and a large percentage (68-91%) were English Learners

(ELs). Additionally, all but one of the BIAs were female, all self-identified as Latina/o, and 70% of them had their bachelor's degree with the remainder having their Associate of Arts (A.A.) degree or working toward their bachelor's.

Furthermore, to investigate the implementation of the BIA program, I trained a group of undergraduate research assistants to assist with collecting an assortment of data from classrooms during the implementation period (October 2018-May 2019). Data included interviews with first-grade teachers who received assistance from the BIAs, interviews with the BIAs themselves, observations of their instructional delivery, time-log diaries, and BIAs' schedules. The data were then integrated using a mixed methodological framework (Creswell & Clark, 2018).

I collected these data to provide a richer understanding of implementation features that might help explain why BIAs were more or less successful among different classrooms, as well as to gain a deeper understanding of the contextual background and program implementation components that are important for study replication and increasing generalizability. District leaders were clear in their intentions to continue funding the program in the coming years and welcomed the opportunity to gain insight into which classroom implementation practices seemed most promising for raising the reading performance of first graders in selected schools. Hence, this mixed methods research approach made optimal use of various data sources at the classroom-level to provide new insights and included the voices of first-grade teachers and paraprofessionals to learn more from their perspectives.

Overview of the BIA Program

The following section provides an overview of general implementation features of the BIA program. Specifically, I discuss the training BIAs received, the overall content and

delivery of their instruction, Spanish language use in BIA classrooms, a description of the level of communication between BIAs, the teachers they assisted, and school leaders, as well as other general implementations features.

BIA Training

The district provided a full-day training session at the beginning of the academic year, which included ice breakers, a guest presentation by university faculty and researchers discussing relevant research on language, phonological awareness, and reading achievement, specifically with an emphasis on English Learners (ELs), and a rundown on best teaching practices for teaching foundational literacy skills to emerging or struggling readers. This was followed by a half-day training session after BIAs spent some time in the classrooms. After these initial trainings, BIAs continued to attend training meetings for two hours each month to continue learning about teaching strategies they could utilize with their students. During these district-led training sessions, emphasis was placed on phonics instruction and the importance of phonological awareness for reading skill development. BIAs also had the opportunity to practice teaching such skills after observing the trainers, learned more about their role in the classroom, asked specific questions they had about any issues they confronted, and received some training on behavior management.

During the winter term, the district hired an instructional coach who went to each school site to provide the instructional aides further training on how to organize and implement the curriculum in small group settings, to observe their instruction, and provide feedback. The instructional coach went to the school sites once a week for about a month, and BIAs were able to reflect on and discuss their instructional experiences. Aside from the training provided by the district, some BIAs also received additional training at their respective school sites.

Instructional Content

The instruction the BIAs provided to students largely reflected the training they received. They reviewed specific phonics lessons with students, often mirroring the teacher's lesson of the week, reviewed letters, sounds, digraphs, word families, multisyllabic and sight words, blending and segmenting words, read decodable books, had students practice their reading fluency, assessed reading comprehension, assisted students with spelling and dictation, and monitored student progress by maintaining student records. The BIAs frequently used repetition and consistent practice with word lists in the form of flash cards to reinforce prior lessons, and they reviewed concepts depending on a student's reading level and teacher feedback. BIAs also created flashcards for students to take home so they could practice words they were struggling with, and regularly used whiteboards to facilitate instruction.

Instructional lessons were teacher-directed and drawn from the Benchmark Advance (Dorta-Duque de Reyes et al., 2017) and Open Court curricula (U.S. Dept. of Education, 2014), and also included lessons from the SIPPS (Systematic Instruction in Phonological Awareness, Phonics, and Sight Words) program (Shefelbine & Aldridge, 2013) that many teachers were familiar with. Depending on the amount of time a BIA was in a classroom, they also sometimes assisted with whole-class instruction by walking around the classroom to help students that were struggling with understanding or completing assignments, especially writing assignments, and they also occasionally assisted with math, science, and art projects.

Instructional Delivery

Each school had discretion in how to organize the BIAs' schedules; thus, the frequency and intensity of supplemental instruction varied from school-to-school and from classroom-to-classroom. For instance, within some schools, BIAs were placed in only kindergarten and first

grade classrooms, whereas in other schools, BIAs assisted all grade-levels and floated between classrooms. Nonetheless, the BIAs' schedules were consistent throughout the year, and many of the BIAs provided both small group and individualized instruction depending on student need and teacher preference. The amount of one-to-one and small group instruction first-grade students received varied from 10 to 40 minutes per day at least 3-5 times per week, and student groups were often readjusted throughout the year depending on student progress.

The BIAs reported spending minimal time on administrative tasks. When they did undertake such tasks, they typically included making copies for teachers when they could not do it themselves, preparing homework packets for the week, grading progress monitoring assessments, or preparing their own instructional materials to use with students. They primarily completed these tasks during early release days or the lunch hour but rarely during class time.

Spanish Language Use

Most of the BIAs stated that they used their Spanish language abilities specifically to facilitate instruction for Spanish speaking students within the classroom. Although all BIAs claimed to have very few students with little or no English proficiency, they asserted that these students responded better to their Spanish directives and translation of the content being covered, and that the BIAs Spanish usage helped the students become better integrated into the classroom. According to BIAs, having a Spanish speaking adult in the classroom helped students not only feel more comfortable asking questions, but provided them with greater access and opportunities to engage in conversations and participate in the learning environment. One BIA noted, "There are some students that do come from Spanish speaking families, and they only know Spanish, so [they're] coming to me and asking me in Spanish, *What did the teacher say?* Or *Where am I supposed to be?*"

Aside from occasionally using Spanish to scaffold instruction for newcomer students, Spanish speaking teachers also reported using Spanish to interact playfully with students or build relationships, draw connections between the material and students' background knowledge, make academic concepts clearer to students, and communicate with parents about student progress. One teacher remarked, "I think it's important for teachers to understand where their students are coming from and to know their culture, their language, and how to communicate with their parents. I think it is a very important piece of their education."

Communication between Teachers and BIAs

The level of interaction between teachers and BIAs beyond discussing instructional activities was minimal. BIAs reported that teachers assisted and guided them by rearranging their groups or providing them with appropriate feedback. Some of the BIAs had weekly or biweekly meetings with school administrators and teachers on early release days to review student progress, discuss possible changes to student groupings, or simply just to touch base.

Overall, teachers described their relationship with the BIAs as professional, friendly, and pleasant, and the open communication between them was essential for developing an efficient daily routine. Teachers often remarked that aides were observant, asked questions when something was unclear to them, and understood what they were expected to do. Teachers were also understanding of the support the assistants needed by not being too critical but viewing them as teachers-in-training and regularly checking in with them to see if things were going smoothly. Additionally, teachers served as role models for the BIAs, and some even provided the BIAs with professional advice encouraging them to obtain their teaching credentials.

Other Implementation Features

Many teachers said they did not face any constraints with having an instructional

aide in their classroom. However, more than one-third commented on the issue of timing or scheduling as not enough or not optimal, yet they often acknowledged that the presence of the aide in their classroom, even if it was for a limited amount of time, was better than receiving no support. Teachers often expressed that they adapted their instruction and organized their classrooms to align with the BIAs' schedules and often worked around timing constraints. Several teachers further urged the district to reduce student to teacher ratios not to exceed 20:1. As one teacher commented, "this should be nonnegotiable." Many students within their classrooms needed a substantial amount of instructional support to reach grade-level performance in reading and other subject areas, so having the support of an instructional assistant was very helpful to them.

BIAs also echoed teachers' concerns in regard to scheduling. One BIA proclaimed, "...being assigned to [one] grade... would be better, that way we can really focus on the material for that specific grade because having to switch from one grade level to the next to the next... is becoming stressful." Another reiterated this concern, "Sometimes I feel rushed where I cannot talk to the teachers as much because every hour I'm with a new one, and sometimes I need to write my own notes because I can't keep track of what I do." Aside from scheduling constraints, the BIAs requested more planning time to communicate with teachers about student progress.

Another issue BIAs presented was the disorganization of the program at the beginning of the year. They mentioned being placed in classrooms without clear structure or guidelines on what they were expected to do, and this sentiment was shared by teachers as well. It took a few weeks for the teachers and BIAs to discover how best to organize instruction and establish a routine. BIAs also expressed a desire to receive more training in strategies for scaffolding instruction in other subject areas, such as mathematics and science, as well as

instructional strategies to make better use of their Spanish language abilities during instruction.

Summary and Conclusion

There were several implementation components and contextual factors of the BIA program (discussed above) that were relevant to its impact and effectiveness. First, BIAs were members of the community and resembled students' ethnic backgrounds. Their cultural similarities and Spanish speaking abilities allowed them to relate to and communicate with the students they instructed. However, BIAs received minimal to no training on utilizing their Spanish language abilities, so one area of improvement would be to provide them with more guidance on how to effectively make use of Spanish language strategies to scaffold reading instruction. Nonetheless, the BIAs' presence in these classrooms allowed many of the Spanish speaking students to feel more comfortable asking questions and engage in the learning environment. This was certainly an important feature of the program given the student demographics in the district where many students are classified as ELs.

Second, BIAs received ongoing training throughout the year, and this training heavily emphasized phonics instruction. Moreover, the district went a step further by hiring an instructional coach whose role was to model small group instruction, and she gave the BIAs explicit feedback on their instructional delivery. Although the BIAs were provided with training at the beginning of the year, some BIAs still felt unprepared for their roles, and this was partially because each school and classroom had discretion in how to implement the program. Thus, another area of improvement would be to provide school leaders and teachers with clear guidelines on how to organize instruction and student grouping, which would reduce confusion and address their initial concerns. This could also be discussed at an initial onboarding meeting within each school to make expectations clear and ensure all teachers are on the same page.

Third, regarding instructional content, the district's intention was for the BIAs to focus on providing supplemental reading instruction; however, some BIAs, particularly those who were in 1st grade classrooms all day or for most of the day, often assisted and provided instruction in other content areas, including mathematics and science, even though they did not receive any training in these areas. Training BIAs and having them focus on providing supplemental math and science instruction is another topic of future research.

Finally, open communication between BIAs and teachers was essential for their effectiveness in scaffolding instruction. From interviews with teachers and the BIAs, it was evident that those BIAs who remained in the same classrooms throughout most of the day had greater opportunities to discuss student progress, ask questions, and receive feedback from the teachers. However, for those BIAs that floated between several different classrooms, they often experienced limited opportunities to talk to the teachers they were assisting. Having BIAs float between classrooms was one of the limitations of the study because of the reduced amount of time they assisted 1st grade classrooms, which was an implementation feature that is further explored in the next chapter.

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CHAPTER 3

Study 1. Do Paraprofessional Instructional Assistants Raise the Reading Performance of Latina/o First Graders in a Low-Income District?

Abstract

One relatively low-cost mechanism to assist teachers serving many EL students and struggling readers is to hire, train, and manage paraprofessionals to provide supplementary instruction to such students. This study evaluated a program in which one district provided instructional aides to all first-grade teachers in the lowest-performing schools. To estimate program effects on reading, I used matched comparison schools in two research designs. One was a comparative interrupted time-series design, which compared school-level test score averages for treatment and comparison schools before and after program implementation. The other analyzed student-level test scores in these schools before and after the program. Both yielded positive estimates of program effects, one significant at the $p<.10$ and the other at the $p<.05$ level.

Keywords: paraprofessionals; English learners (ELs); supplemental reading instruction

Introduction

In this study, I evaluated the effectiveness of one strategy aimed to improve the reading performance of Latino first graders, that is by hiring paraprofessional instructional assistants to provide supplemental literacy instruction to students, particularly those from Spanish-speaking homes. As described in the previous chapter, Biliterate Instructional Assistants (BIAs) were placed in select schools to assist and supplement the instruction provided by first-grade teachers (Goe & Matlach, 2014). Thus, I evaluated the success of the paraprofessionals in promoting students' foundational literacy skills by comparing the reading test scores of students in schools that received BIAs with those of students in comparison schools that did not receive BIAs within the same district who were selected to match these schools. I used two methods to assess the effectiveness of these paraprofessionals on student outcomes. First, I employed a comparative interrupted time-series design to compare school-level test score averages for treatment and comparison schools before and after program implementation. Then, I analyzed student-level test scores in these schools before and after the program during the implementation year. In the following section, I present an overview of the literature on supplemental reading instruction and the effectiveness of paraeducator-led reading instruction.

Literature Review

Effective Reading Instruction

According to the National Reading Panel (2000), the five components necessary for effective reading instruction are phonemic awareness, phonics, fluency, vocabulary, and comprehension. Also, both individual (e.g., working memory, motivation) and environmental (e.g., formal and informal instruction) factors influence the reading comprehension skills of monolingual and bilingual students alike (August & Shanahan, 2006). Hakuta, Butler, and Witt

(2000) have also noted that it can take language minority students from 3 to 7 years to develop sufficient English oral language proficiency skills necessary for academic excellence. Thus, effective reading instruction for English Learners (ELs) requires appropriate second-language scaffolding and high-quality instruction targeting different areas of reading throughout their elementary school years and beyond.

The IES Practice Guide (Gersten et al., 2008) offers specific recommendations to educators in identifying students who need targeted support in reading when core instruction is, by itself, insufficient. Within a multi-tier system of supports (MTSS) framework, the Guide recommends that educators provide students scoring below a benchmark score with intensive and systematic instruction on up to three of the reading components (outlined above), three to five times per week, for 20 to 40 minutes per day, in small groups. They also state that it does not matter whether a teacher or a paraprofessional provides the instruction, but instruction should be highly explicit, systematic, interactive, and must include instruction in other reading components beyond phonemic awareness and decoding, such as vocabulary and comprehension.

Supplemental Reading Instruction

Accordingly, one common approach for improving the foundational literacy skills of ELs and struggling readers is providing them with supplemental reading instruction in the early grades. Foorman and Torgesen (2001) note that this instruction must be made more comprehensive and explicit, more intensive, and more supportive in small group and one-to-one formats to ensure students' needs are being met. Several studies reviewing prior research on programs for struggling readers in elementary school have reported the positive effects of one-to-one and small-group tutoring on both standardized and researcher-developed reading measures (Gersten, Newman-Gonchar, Haymond, & Dimino, 2017; Neitzel, Lake, Pellegrini, & Slavin,

2021). Important to note is that the Gersten et al., (2017) review excluded programs that specifically targeted EL students and did not distinguish outcomes based on who delivered the intervention (e.g., teachers, paraeducators, or researchers).

Neitzel, Lake, Pellegrini, and Slavin (2021) reviewed programs for struggling readers in elementary school. Studies in their review needed to include independent reading measures (they excluded studies using measures developed by the program implementers themselves), and programs had to be implemented by school personnel, such as teachers and teaching assistants. They found an overall positive impact of reading programs across 65 studies (ES=0.23). No significant differences in outcomes were found between teachers and teaching assistants serving as tutors, though programs offering one-to-one tutoring resulted in significantly better outcomes than small-group tutoring (ES=0.41 vs. ES=0.24, respectively). As in the other reviews, they did not identify or code for the language status of study participants.

Supplemental Reading Instruction for ELs

In a review of reading programs for Spanish-dominant EL students, Cheung and Slavin (2012) found that structured small-group and one-to-one tutoring programs had overall effect sizes of 0.48 and 0.19, respectively, across 8 studies that met inclusion criteria. Although the overall effect size of small group tutoring was larger than one-to-one tutoring, the programs included in this review varied in terms of sample characteristics and program structure, making it difficult to compare the two types of tutoring. Nevertheless, the programs that were proven to be effective in promoting students' reading skills included extensive coaching and professional development for teachers and paraeducators who were tutors. These programs also provided educators with explicit curricular manuals and materials while offering ongoing support and

feedback throughout program implementation, though they did not distinguish study outcomes based on who implemented the program.

Richards-Tutor and colleagues (2016) reviewed research on the effectiveness of reading interventions for ELs who were identified as at-risk for reading difficulties or with a learning disability. They identified twelve randomized control trials (RCTs) published from 2000 to 2012. Spanish was the home language of participating students in all but two of the studies, and only three employed paraprofessionals as interventionists. Across seven studies that focused on kindergarteners and first graders, findings indicated that the reading interventions had statistically significant moderate-to-large effects (ES=0.58-0.91) on beginning reading skills. Furthermore, they found no significant moderating variables, including group size, minutes of the intervention, or personnel delivering the intervention (i.e., researchers vs. school personnel). Again, they did not distinguish differences in program effectiveness between teachers and paraprofessionals.

Paraprofessionals as Reading Tutors

The reviews cited above offer substantial support for providing struggling readers and ELs with supplemental reading instruction. However, there has been less focus on evaluating the effectiveness of paraprofessionals in delivering this instruction. This is significant given the increasing presence of non-certified instructional support staff in districts receiving Title I funds, particularly those with greater enrollments of minoritized students, ELs, and those from low-income backgrounds (U.S. Dept. of Education, 2007).

The U.S. Department of Education defines paraprofessionals as those individuals employed by schools and supervised by certified or licensed teachers who provide instructional support to students, including support for language instruction programs, special education, and

migrant education (Every Student Succeeds Act (ESSA) Section 3201, 20 U.S.C. 7011[11]). Considering the instructional roles of paraprofessionals in many public schools across the nation, legislation also now requires that paraprofessionals employed in Title I programs should have completed at least two years of study at a higher education institution or an equivalent level of education (Lewis, 2005).

In a recent review of literature on the overall effectiveness of paraprofessionals as reading tutors, Jones, Erchul, and Geraghty (2020) found the mean effect size of paraeducators across nine studies and six reading outcomes was ES=0.55. However, only two of the studies included in their review specifically targeted language minority students, and all the studies were conducted in settings that included researcher training and support. In a best-evidence synthesis of the literature, Samson, Hines, and Li (2015) identified three key components associated with the effective use of paraprofessionals as reading tutors. Like the recommendations offered by Cheung and Slavin (2012), the three components they identified were (1) extensive training of paraprofessionals in delivering research-based reading instruction, (2) ongoing supervision of tutors, and (3) access to scripted reading lessons with an emphasis on phonics instruction.

Aside from the studies cited above, much of the research on the use of paraprofessionals for instruction has been qualitative or observational in nature (Bonner, Pacino, & Stanford, 2011; Causton-Theoharis, Giangreco, Doyle, & Vadasy, 2007; French, 2001; Giangreco, 2003), and much of this research has focused on paraprofessionals' roles in supporting students with identified disabilities in inclusive settings (Giangreco, Suter, & Doyle, 2010; Mason et al., 2020), with very little focusing on their work with EL students.

Current Study

Although the evidence on paraprofessionals as reading tutors looks promising, there is still quite limited research on their overall effectiveness in improving the reading performance of ELs. Additionally, many of the supplemental reading programs implemented by paraeducators and evaluated in the literature cited above were developed and implemented by researchers, typically working from research grants. By contrast, in the current study, district administrators were responsible for hiring, funding, training, and providing ongoing support to paraprofessionals to improve student reading outcomes at selected schools.

Hence, the current study expands the evidence-base by evaluating a large-scale implementation of paraprofessional reading tutors within one low-income school district where student enrollment was almost completely Latina/o. This study expands the evidence-base in at least four ways: (1) Assesses the impact of bilingual paraprofessionals on the English reading achievement of Spanish-dominant EL first graders, (2) Evaluates the effectiveness of paraprofessionals hired and trained by district and school-leaders as opposed to researchers, (3) Analyzes individual and school reading outcomes using standardized reading measures, (4) Investigates the relationship between two implementation features (i.e., amount of time BIAs were in classrooms and instructional group size) on classroom reading outcomes. The following research questions were addressed: (1) What is the school-level impact of Biliterate Instructional Assistants (BIAs) on the reading performance of first graders in selected schools? (2) What is the individual-level impact of BIAs on the reading performance of students within these schools? (3) Do certain features of program implementation (i.e., group size, amount of time in classrooms, instructional content and delivery, student progress monitoring, behavior management, and communication with teachers) help explain which classrooms made greater and lesser gains in reading during the implementation year?

Data and Methods

Participants

Six schools providing academic instruction primarily in English were selected to receive BIAs in the fall of 2018, based on their ELA performance and growth in prior years. Demographic characteristics (i.e., percent female, Latina/o, EL, free or reduced-price lunch status (FRPL), and parent education level) and fall of 2018 average reading performance of each non-BIA school in the district were then compared to the six BIA schools through significance testing. A total of five non-BIA schools matched at least one of the six BIA schools ($p<0.05$ on all covariates and test scores) in the fall of 2018 (during the implementation year) and were included as comparison schools in the comparative interrupted time series (CITS) and student-level analyses described below.

Tables 3.1 and 3.2 summarize the demographic characteristics and average reading test scores of the BIA and comparison schools, respectively. Regarding missing data, less than 15% of all participants included in the student-level analysis had missing data on any of the covariates included in the regression model. Multiple imputation was used to account for these missing data and results using imputed data are presented in Table 3.5. Although the data are multilevel, we chose not to use hierarchical linear modeling to estimate the effects. Instead, we used the "sandwich" estimator in Stata, which gives equivalent results (McNeish, Stapleton, & Silverman, 2017).

Table 3.1 shows that within each school included in the sample (n=11), over 97% of students were Latina/o, a large percentage were English Learners (68-91%), and over 84% qualified for free or reduced-priced lunch. Overall, BIA and comparison schools did not differ significantly on demographic characteristics and test scores at the beginning of the

implementation year (2018-19). Superscripts show that each comparison school matched many of the BIA schools on all variables. The overall statistics for the two groups of schools (BIA and comparison) also matched quite well.

Table 3.2 shows each school's average fall 2018 and spring 2019 first-grade scores on the DIBELS nonsense word fluency and oral reading fluency subtests, respectively. Overall, the program schools began the year about two points below the comparison schools and ended the year about three points above the comparison schools, suggesting the likelihood of a positive program effect. This is tested more formally below.

As for program implementation, biliterate instructional assistants (n=27) were all female, except for one male participant, and all identified as Latina/o. Between three and five BIAs were placed at each of the selected schools corresponding with the number of first-grade classrooms at each site. In accordance with federal and state policy, hiring criteria required all BIAs to have at least an Associate of Arts (A.A.) degree or 48 college or university units. Of the 27 BIAs interviewed, 70% of them had bachelor's degrees, two were credentialed teachers, another three were pursuing their bachelor's degree, and the remainder had their Associate of Arts degree. Given the large percentage of Spanish speaking students within the district, BIAs were also required to pass a Spanish language proficiency exam to be eligible for hiring.

First-grade classrooms (n=28) within selected schools that received BIAs were included in the classroom-level analyses. Interview data from participating teachers (n=24) was combined with BIA interview data, classroom observational data, and BIA schedules. Of all teachers that were interviewed, 33% self-identified as Hispanic, Mexican, or Latino/a, 11% as Asian/Pacific Islander, 50% as White or Caucasian, and 5% Mixed. Prior teaching experience ranged from 4 to 40 years, and ten teachers reported being fluent in Spanish.

Prior to data collection, this study was approved by the Institutional Review Board in the Office of Research at the University of California, Irvine, protocol number 2019-4909. Approval was also obtained by the Research and Evaluation office at the participating school district. Participating teachers, paraprofessionals, and school leaders provided informed consent during an initial meeting where they were given more information about the study.

Measures

Students' standardized scores on district-administered reading assessments were used to assess the impact of BIAs on reading outcomes. The Nonsense Word Fluency (NWF) subtest of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; University of Oregon, 2018) is administered to first graders at the beginning of each school year. This measure assesses letter-sound correspondence and students' ability to blend basic vowel-consonant (VC) and consonant-vowel-consonant (CVC) words. The reliability estimate for this measure is 0.94, the median concurrent validity with the Woodcock-Johnson Psycho-Educational Battery is 0.51 and with the Stanford Binet Verbal Reasoning and Abstract/Visual tests is 0.30 and 0.32, respectively (Good, 2004).

The DIBELS Oral Reading Fluency (ORF) subtest was administered to first graders at the end of each school year. Students were asked to read a short passage, and their score was the total number of words they read correctly in one minute. Alternate-form reliability for the ORF is above 0.90, and concurrent validity ranges between 0.92-0.96 (Good et al., 2004). The DIBELS tests were administered by school staff, including school psychologists and certified teachers. Demographic data were also collected by the district and included EL status, FRPL status, parent education level, and whether the student was eligible for special education.

Overview of Study Design

This study is divided into three levels of data analysis (i.e., school-, student-, and classroom-level) to optimize the use of school-level data collected across multiple years, as well as individual- and classroom-level data collected during the implementation year (2018-19). To assess whether BIAs had a positive impact on the average first-grade reading performance of students within selected schools (RQ1), BIA and comparison schools' average spring of 2017 to 2019 DIBELS scores were used in short comparative interrupted time-series (CITS; Hallberg, Williams, Swanland, & Eno, 2018) analysis, controlling for their fall scores each year. The CITS design allows for differences in initial performance between treatment and comparison schools as long as their school-level achievement followed parallel trends during academic years 2016-17 and 2017-18, prior to the implementation of the program. This is known as the parallel trends assumption (Mora & Reggio, 2013). This can be understood through a causal framework where the counterfactual condition is predicted based on preprogram slopes. In other words, school outcomes during the postprogram period (Spring of 2019) for both BIA and comparison schools are projected from their preprogram trends (Spring of 2017 and 2018), so that any significant changes in the postprogram slopes of BIA but not comparison schools' test scores can be attributed to the program. By comparing test score changes of BIA and comparison schools, any time-invariant school characteristics (both observed and unobserved) among the two groups of schools are differenced out of the equation. Thus, as long as any differences in the preprogram slopes are appropriately accounted for, CITS can yield unbiased program effects.

Prior to running the CITS model, the parallel trends assumption was tested by graphing BIA and comparison schools' average reading performance gains during the pre- and post-program period with academic year on the x-axis and average standardized gains on the y-axis (see Figure 1.1). A visual inspection of this graph clearly depicts the parallel trends of BIA and

comparison schools during the two years prior to the implementation of the program. A significance test of the null hypothesis that the slopes were identical was run, H_0: $b = b_1 - b_2 = 0$, resulting in b=0.08, t=0.18, p=0.86 and provided confidence in using CITS analysis to evaluate the impact of the program given the parallel trends of both groups during the preprogram period.

CITS Analysis of School-Level Data

This study utilizes the baseline mean model, which is the simplest modeling approach and is characterized by the following equation,

$$Y_{jt} = \beta_0 + \beta_1 POST_t + \beta_2 PRO_j + \beta_3 POST_t PRO_j + \beta_4 FALL_{jt} + \beta_5 EL_{jt} + v_j + u_{jt} \quad (1)$$

Where Y_{jt} is the average spring reading outcome for school j at time t; β_0 is the intercept for the average spring reading performance of comparison schools during the preprogram period; $POST_t$ is a dichotomous indicator of whether year t is a pre- or post-program year (1=postprogram year); β_1 is the average difference in the spring reading outcomes between pre- and post-program years; PRO_j is a dichotomous indicator of whether school j received the program; β_2 is the average difference in performance between BIA and comparison schools during preprogram years; $POST_t PRO_j$ is an interaction term identifying BIA schools after the program was implemented; $FALL_{jt}$ is average fall reading performance for school j during year t; EL_{jt} is the percentage of ELs for school j during year t; v_j is a school-level random error term; and u_{jt} is a random error term. β_3 is the estimate of program effects assuming all BIA schools and all comparison schools share the same trend, respectively. This model was also adjusted for clustering at the school level using robust standard errors. Furthermore, to reduce bias arising from the small number of school clusters (n=11), a bias reduced linearization (BRL) estimator was also calculated using the cluster-robust (sandwich) variance estimator command in STATA (Bell & McCaffrey, 2006).

Regression Analysis of Student-Level Data

To provide a second estimate of the impact of BIAs on student performance (RQ2), multiple regression analysis was conducted using individual-level data with the following equation,

$$Y_i = \beta_0 + \beta_1 FALL_i + \beta_2 BIA_i + ... + \beta_k Xk_i + u_i \quad (2)$$

In this equation, Y_i is student i's spring DIBELS score; β_0 is a constant term; $FALL_i$ is student i's fall DIBELS score; BIA_i is whether student i attended a school with BIAs; X represents student-level demographic characteristics (i.e., EL, FRPL, parent education level, and eligibility for special education); and u_i is an error term. In this model, β_2 is the standardized regression coefficient estimate for the predictive relationship between spring reading performance and attending a school with BIAs in comparison to attending matched schools who did not receive BIAs, controlling for fall reading scores and demographic characteristics. Additionally, robust standard errors are estimated in this model to account for heteroskedasticity and the clustering of students in classrooms.

Analysis of Classroom-Level Data

A mixed methodological framework was utilized to address the third research question, (i.e., Do certain features of program implementation help explain which classrooms made greater and lesser gains in reading throughout the first year of implementation?). In this case, the unit of analysis was first-grade classrooms (n=28) in BIA schools, since only these received BIAs. During the implementation year, both the instructional assistants and the teachers they assisted were interviewed, and interviews lasted anywhere from 20 minutes to one hour. After each interview, instructional assistants were handed three time-log diary templates and asked to log their daily instructional activities on three separate days (see Appendices A and B for samples of

the interview questionnaire and time-log diaries, respectively). Observations of the BIAs' instructional delivery were also collected depending on schedule availability. Observations spanned a minimum of one hour, and included the instructional setting, number of students in a group, and instructional activities. The interview and observational data were analysed to address the third research question by conducting a convergent mixed method design.

The purpose of a convergent mixed method design is to merge the qualitative data with the quantitative data to complement the quantitative findings (Creswell & Clark, 2018). This approach allows for a more complete understanding of the implementation of the BIA program and provides more descriptive information about the program's effectiveness that would not have been as clearly understood with the quantitative data alone. The methodological steps involved in this mixed method analyses were as follows: 1) The quantitative and qualitative strands of the study, including the research questions, analytic approaches, study samples, and measurement instruments (i.e., interview questionnaires, time-log diaries, test scores, and demographic information), were determined prior to data collection; 2) The quantitative and qualitative data were analysed independently; 3) These data were then merged following the strategies outlined below in the quantitative and qualitative analysis sections below; 4) The quantitative findings were summarized and interpreted followed by a review and discussion of the qualitative findings to reveal further explanations related to the quantitative findings.

In this study, there were two primary strategies used to merge these data. First, some of the findings from the qualitative analysis were transformed into quantitative data (i.e., observations of instructional delivery were converted to numerical and categorical variables). Then, this data was used to conduct further statistical analyses. Second, themes that were

generated from the qualitative data were compared and contrasted based on a pre-determined analytic procedure (described below).

Quantitative Analysis. Since the qualitative data collection was organized at the classroom (teacher) level, and some classrooms received more BIA time than others, while some primarily used 1-1 instruction and others used small group instruction, I sought to estimate the success of individual BIA classrooms by using regression analysis to predict BIA classrooms' (n=28) average spring scores while controlling for the amount of BIA time, instructional grouping type, the classroom's fall average test score, and percent EL. This is shown in equation (3).

$$Y_i = \beta_0 + \beta_1 AMT_i + \beta_2 GROUP_i + \beta_3 FALL_i + \beta_4 percentEL_i + u_i \quad (3)$$

The amount of time (minutes) BIAs spent in classrooms (AMT) was calculated using their time-log diaries and schedules. Instructional grouping (GROUP) included three dummy variables for the primary type of instruction BIAs provided to students in each classroom (i.e., 1-1 or 2-1, small group, or large group) with the large group serving as the reference group. Small groups included instructional groupings with three to four students, and large groups included five or more students in a group. In some instances, BIAs were observed or reported assisting students individually as well as in larger groups. Nevertheless, each classroom was coded as primarily offering one of the three types of instructional groupings to students. These categorizations were determined by triangulating across all data sources, including interviews, observations, and time-log diaries. In this model, the amount of time BIAs spent in classrooms and the size of groups are the independent variables, so that β_1 and β_2 estimates are the program effects.

Qualitative Analysis. The classroom-level multiple regression analysis was then combined with qualitative analysis in the following way. First, interviews, time-log diaries, and

observational notes were transcribed by undergraduate research assistants, and I sorted through these data to separate text into codes. Codes were organized using labels, such as "Education", "Prior Experience", "Spanish usage", etc. The following codes were pre-determined based on the interview questionnaire: background characteristics and prior experiences of teachers and BIAs; Spanish language background and use; BIA training; communication between teachers and BIAs; BIAs' instructional activities and duties (both reported and observed); and comments, concerns, and/or suggestions going forward.

After generating these codes, information gathered from the interview as well as observational data were inputted into an excel sheet with each code representing separate columns and each BIA/classroom representing separate rows. Transcripts from the interview and observational data were inputted into the excel sheet under the appropriate column headings. I read through each column and summarized general findings for each code. For instance, under the column titled, "BIA Training", I read through each transcript and summarized the information provided by each BIA while also checking for consistency across all transcripts. The codes or topics that had more variation in terms of the BIA's responses (e.g., communication with teachers, student grouping, scheduling, etc.) were then color coded to distinguish those classrooms that shared similar themes or perspectives and those that differed.

Next, classroom-level residuals were predicted from a best-fitting line using Equation 3 above. Classrooms with large positive residuals represented those who made substantial progress beyond the prediction curve and classrooms with large negative residuals were those who made the least progress, controlling for average fall scores, percent EL, amount of BIA time, and instructional grouping. The four classrooms with the largest positive residuals and four

classrooms with the largest negative residuals were selected to compare and contrast using the coded information.

This qualitative analysis was intended to reveal any potential similarities or differences in the implementation of BIAs between classrooms who made the highest and lowest gains, and to provide insight into the instructional strategies that appear most promising in improving classroom-level reading performance for classrooms who received BIAs. I focus on classroom outliers for this analysis because the intention was not to test different implementation components since I did not collect quantitative measures of these components. Rather I deduced from the data which implementation features appeared most salient in distinguishing between the classrooms with the highest and lowest gains among all who received BIAs.

Results

School-level Results

Table 3.3 presents the results of the CITS analysis, estimates of the parameters in equation (1). For the six BIA and five comparison schools, the equation predicts first-grade spring test scores for two preprogram years (2017 and 2018) and one postprogram year (2019). After controlling for schools' average DIBELS Nonsense Word Fluency scores in the fall and percentage of ELs during any given year, schools who received BIAs averaged .825 of a standard deviation higher than controls on the DIBELS Oral Reading Fluency subtest administered in the spring, and this was a marginally significant finding ($p<.10$; Model 3). This p-value is considered acceptable given the small number of clusters and considering this was a pilot study. Although the two groups of schools followed parallel trends prior to the implementation of the program (2016-17 and 2017-18), during the implementation year (2018-

19), BIA schools exhibited steeper growth in reading performance when compared to matched comparison schools (Figure 1.1).

Student-level Results

Descriptive statistics for students with complete data within BIA and comparison schools are found in Table 3.4. Overall, students within these schools were largely from Spanish speaking homes with 82% of them classified as English Learners, 93% qualified for the free or reduced priced lunch program, and a majority of their parents had a high school diploma (36%) or did not graduate from high school (49%). Students in BIA and comparison schools gained approximately 20 and 14 raw score points, respectively, from fall to spring on reading tests suggesting that the BIAs had a positive influence on students' test scores.

Table 3.5 shows the results of the student-level regression analysis using complete data, as well as multiple imputation results used to account for missing data. After controlling for students' demographic characteristics and fall test scores, students within BIA schools performed .193 of a standard deviation higher on the spring DIBELS compared to their peers in comparison schools, and this was a significant finding ($p<0.05$; Model 1). Likewise, the results from the multiple imputation analysis using all available cases yielded nearly the same estimate. In this model, students in BIA schools compared to those in non-BIA schools performed .195 of a standard deviation higher on spring DIBELS scores, controlling for fall scores and demographics, and this was also a significant finding ($p<0.05$; Model 2). Thus, the school-level CITS (equation 1) and the student-level fall to spring analyses both yielded positive program effects, significant at the $p<.10$ and $p<.05$ levels, respectively.

Classroom-level Results

Effects of Instructional Time and Group Size

The total amount of time BIAs spent in first-grade classrooms at their respective school sites ranged from 0 to 200 minutes per day, with an average of 121 minutes per day (see Table 3.6). It is important to note that the amount of time spent on reading instruction within each classroom varied and differed from the total amount of time BIAs spent in these classrooms. In terms of instructional groupings, 11 classrooms provided supplemental reading instruction primarily individually or in pairs, 6 classrooms offered small group instruction (3-4 students per group), and 11 classrooms offered primarily large group instruction (5 or more students).

Table 3.7 shows regression analyses predicting average spring test scores across the 28 first-grade classrooms with BIAs. Model 1 has fall scores and percent EL as predictors, Model 2 adds the amount of time spent by the BIA in the classroom daily, and Model 3 adds dummy variables for the instructional grouping. Interestingly, as we add controls, moving from Model 1 to Model 3, the negative percent EL effect becomes smaller and loses statistical significance, suggesting that once the daily amount of time with the BIA and the instructional group size are accounted for, ELs are learning as much as non-ELs.

Model 3 shows that the amount of time with a BIA, which was measured in minutes, was positively and significantly associated with spring reading performance. For every additional hour of BIA instruction, classroom reading fluency increased by .459 of a standard deviation. (Since the standard deviation of the amount of time variable is approximately one hour, this says that a one standard deviation increase in instructional time yields a .459 standard deviation increase in reading performance, a sizeable effect.) Model 3 also shows that 1-1 or 2-1 instruction provides a positive effect of .634 of a standard deviation when compared with large group instruction, and almost as large an increase compared to small group instruction. This

finding suggests that instructional group size can be very important for creating a positive program effect.

Comparing and Contrasting BIA Classrooms

As previously noted, classroom-level residuals were predicted from the best-fitting line of the classroom-level regression above, and the qualitative data for the four classrooms with the largest positive residuals and four classrooms with the largest negative residuals were compared and contrasted to highlight notable themes among the "high" and "low" gain classrooms. Although no definitive conclusions can be drawn from the observational data, there were discernible patterns between the high and low gain classrooms that warranted further discussion.

Aside from the amount of time BIAs spent in classrooms and instructional grouping, other features that may have contributed to differences in classroom reading performance were their instructional content and delivery, student progress monitoring, behavior management, and communication between BIAs and teachers. The following sections provide further discussion of the patterns that emerged from the coded data comparing the high and low gain classrooms.

Instructional Content and Delivery. The breadth and depth of the instructional activities facilitated by BIAs was a striking feature distinguishing those classrooms that made the most and least gains. Some teachers, particularly those in the high gain group, systematized instruction by having the BIAs focus on different reading components each day of the week. For example, on Monday, BIAs reviewed prior lessons and introduced the next lesson; on Tuesday and Wednesday, students practiced reading their list of sight words and decodable books corresponding with the sound lesson of the week; on Thursday, students practiced writing words and sentences; and, on Friday, they read passages to practice their reading fluency. This is just

one example of an instructional approach, though the structure of instruction varied from classroom to classroom.

Conversely, teachers in the low gain group stated that they had to limit the instructional activities they had the BIA facilitate because of the limited amount of time they had with them. In the low gain classrooms, BIAs were often observed flipping through sight word or ABC flashcards without monitoring student progress, reading to students while they were not following along, and/or doing repetitive activities, such as reciting letters and sounds in words presented, with little or no time spent on other reading components. Although BIAs in the high gain classrooms also included some of these repetitive activities in their lessons, they nonetheless incorporated a wider range of activities that focused on different reading components, including having students read decodable books, write words and sentences, and practice their reading fluency by reading passages.

Monitoring Student Progress. As noted above, BIAs in the high gain classrooms often tracked student progress by recording which words the student missed or struggled with, then reviewed these words using a whiteboard, letter tiles, or large poster paper, whereas BIAs in the low gain group were observed reviewing words or letters with groups of 4-5 students without tracking the progress individual students were making. Tracking student progress appeared to be improving student outcomes because, by regularly monitoring student progress, the teachers and BIAs were able to decide which lessons needed to be reviewed and when to increase the difficulty of the lesson. Tracking student progress also provided teachers with feedback that helped them determine how to reorganize student groups to ensure that each student was continuously receiving appropriate academic support.

Behavior Management. During their interviews, teachers often remarked that they had several students with behavioral and social emotional needs. Teachers felt they needed greater assistance with addressing their students' nonacademic needs whether through teacher and BIA professional development meetings specifically focused on behavior management, or through school-based pull-out programs designed for students with greater social and emotional needs. Having another adult in the classroom helped reduce the severity of these problems because students were receiving more individualized attention and support, although in some cases this was insufficient to cope with high needs cases. For instance, one teacher described the emotionally charged experiences of her students, such as having a parent shot to death, another losing a parent to cancer, and still, another going through parent separation. The BIAs indicated that they sometimes had to step in and help the teacher manage behavior by pulling individual students aside to determine why the student was upset. They also noted that they often needed to be patient with students, especially with students who had shorter attention spans, and tried to remain mindful of students' level of engagement during their instructional delivery.

Consistent with this, when BIAs were observed working with groups of 3 or more students, which was typically the case among the low gain classrooms, it was quite likely for a student in the group to cause disruption or be disengaged from the lesson. In these larger group settings, the BIA was usually not able to keep track of which students were following along with the text, responding to questions, or engaging with the material that was being presented. Students were more likely to be engaged in the lesson if they were receiving 1-1 instructional support, or if they were paired or grouped with other students who worked well with them and who performed at similar reading levels as them. All four classrooms in the high gain group primarily provided this level of individualized support to students.

Communication between Teachers and BIAs. The extent of supervision and guidance the BIAs received varied across teachers, with some teachers observing the BIAs often to provide feedback and others finding this unnecessary. One notable difference between the high and low gain classrooms was the level of communication and planning between the BIA and teacher. Several BIAs, particularly those in the low gain group, reported that they spent little time in the classroom and would have preferred to receive more guidance from teachers when they were expected to gather their own materials without the teacher's input. They felt that their instruction would be more effective if they mirrored the teacher's lesson plan rather than needing to create their own lessons without teacher input.

Correspondingly, two of the teachers in the low gain group noted that there was little time for communication because they only had the BIA for a limited amount of time. Another teacher in the low gain group felt the BIA was lacking in experience and training, and this created frustration and tension for her. On the other hand, teachers in the high gain group emphasized the constant communication happening between them and the BIAs. They described their BIAs as "very efficient", "very adaptive", and "always taking initiative". Among those classrooms in the high gain group, teachers were reported to be the main source of support for instructional assistants, often providing them with explicit directions, giving them feedback, answering questions, and providing materials for them to use during instruction.

Discussion

I used two methods to estimate the effects of biliterate paraprofessionals serving as instructional aides to first-grade teachers on student reading performance in the lowest performing elementary schools in an almost entirely Latinx, low-income district. The CITS analysis, comparing school-level average test scores for BIA and comparison schools before and

after the program yielded a large, positive effect, ES = .83SD, approaching significance at p<.10. The analysis using students as the unit of analysis and comparing fall to spring test score gains for students in BIA and comparison schools during the program implementation year, yielded a positive effect, ES = .19SD, significant at p<.05. In addition, we used classroom-level information from the BIA schools to estimate the effects of BIA instructional time and instructional group size on achievement. For BIA instructional time allocated to a classroom, there was a positive effect, ES = .46SD, significant at p<.001, and 1-1 or 2-1 groups versus large groups increased classroom reading achievement by .63SD, significant at p<.05.

The magnitude of the impact of the BIA program on DIBELS Oral Reading Fluency scores aligns well with prior research on the effectiveness of small group and one-to-one tutoring. For example, Vadasy and Sanders (2011) found a supplemental phonics program had a significant effect on language minority (LM) students' reading fluency (ES=0.18 SD). Similarly, Vaughn et al. (2006) found a small group reading tutoring program serving Spanish-English bilingual students had a positive impact on a range of literacy skills, though the effect (ES=0.18 SD) on DIBELS reading fluency was non-significant at p<0.05. Despite the substantial variation of implementation features across schools, the BIAs had a large positive impact (ES=0.83 SD, p<.10) on schools' aggregated reading performance, lending support to the district's decision to hire paraprofessionals as an evidence-based approach to raising students' reading performance at these low-performing schools.

Results from the observational data expand the impact findings by providing further insight into those implementation features that were most salient for paraprofessional effectiveness across classrooms. For instance, the amount of time a BIA was assisting a classroom was significantly predictive of classrooms' average reading scores relative to other

classrooms who also received instructional support from the BIAs (ES = .46SD, p<.001). However, many of the BIAs floated between different classrooms and grade-levels, which limited their effectiveness in the first-grade classrooms they were assigned to support. Correspondingly, more than one-third of the first-grade teachers interviewed commented on timing or scheduling as insufficient or not optimal, yet they often acknowledged that the presence of the aide in their classroom, even if it was for a limited amount of time, was better than receiving no support. One stated that they needed the BIA for at least two hours per day to ensure all their students' needs were being met. These sentiments align with recommendations offered by other researchers who warn against overloading paraeducators with instructional responsibilities beyond their level of training or preparation (Giangreco, Suter, & Doyle, 2010).

Furthermore, BIA classrooms that provided 1-1 or 2-1 instructional support significantly outperformed other classrooms that primarily provided supplemental instruction to students in larger groups (ES=.63SD, p<.05). In this study, many of the teachers, particularly those in classrooms that made the highest gains in reading performance, frequently discussed reorganizing student groups based on progress monitoring assessments and feedback from the BIAs. However, some teachers had the BIAs provide supplemental instruction to students in larger groups of five or more, which limited paraprofessional effectiveness. This is an important point because it aligns with prior research suggesting that students with greater academic needs should be provided with more intensive and individualized support based on progress monitoring assessments (Foorman & Torgesen, 2001; Gersten et al., 2008).

Another important feature of an effective reading program is giving students the opportunity to form caring and trusting relationships with educators. The BIAs in this study shared a cultural and linguistic background with students, and their presence in the classroom

shifted the atmosphere in most cases. Having another caring adult in the classroom presented students with greater opportunities to seek personal or academic support, and someone to communicate with in their heritage language.

Study Limitations

The study had at least four limitations. First, the findings of a positive program impact would have been more definitive if the program had been studied across more grade levels and more years of implementation. Second, estimated program effects would have been better protected against selection bias if an experimental design had been used, by randomly assigning schools, classrooms within schools, or students within classrooms to treatment or control status. Instead, matched control schools were used to estimate the counter factual. However, the matching was good, and if any bias was involved, it should have acted against finding a program effect, since the program was implemented in the lowest-performing schools. On the positive side, the data met the CITS requirement for parallel slopes in the preprogram period. Three separate analyses – the CITS analysis comparing test score averages for BIA and comparison schools before and after the program implementation, the student-level analysis comparing fall to spring test score gains for students in BIA and comparison schools, and the classroom-level analysis estimating the effects of BIA instructional time and the size of instructional groups– all gave positive effect estimates, with the first two being significant at the .10 and .05 level, respectively, the BIA instructional time effect being significant at the .001 level, and the group size effect being significant at the .05 level.

Third, reading performance in this study was assessed using the DIBELS oral reading fluency subtest. A more complete analysis of the program's impact on reading performance would include other measures of different reading components, such as phonics, phonemic

awareness, vocabulary/background knowledge, word recognition, reading comprehension, spelling, and Spanish-English language proficiency. As in prior studies, results may vary depending on the choice of reading skill and its measurement instrument. Students were also observed receiving instructional support in writing, mathematics, science, and art activities throughout the week. Thus, a more comprehensive review of the program's impact would have employed a more comprehensive set of measures. Finally, external validity was limited by the restriction of the study to a single school district in Southern California. Replication in other, similar districts would increase the generalizability of the findings.

Implications for Practice

Despite the limitations, the results of this study are promising. They suggest that large-scale, district-administered supplemental reading instruction delivered by biliterate paraprofessionals may improve student performance in a cost-effective way. More importantly, these findings indicate that Latino students and ELs can be properly supported in terms of their reading development by providing them with individualized or small group supplemental instruction tailored to their individual needs. Findings also suggest that policy efforts should aim toward providing more schools with extra funding and teachers with extra support and assistance, particularly those with larger class sizes and greater numbers of students with learning needs. Federal grants could also fund and expand this research to widen the scope of students benefitting from such evidence-based reading programs as the one presented in this study. It is important to provide supplemental instruction to Latino students and ELs during the early grades when they are building foundational literacy skills, as doing so can reduce the prevalence of subsequent reading difficulties and promote these students' long-term reading achievement.

Bilingual paraprofessionals could also serve as language brokers for families by communicating with parents about student progress and offering guidance on how to better support literacy learning at home. For instance, Kosanovich, Lee, & Foorman (2021) provide practitioners with specific recommendations on strategies parents could utilize at home to support literacy learning. Paraprofessionals could collaborate and assist teachers with preparing home literacy activities and explain to families how to engage with their child in an activity. Extending children's learning time outside of the classroom and providing them with greater opportunities to practice literacy skills at home would have a positive impact on their reading performance, as well as engage families as partners in their child's learning.

Still, more research is needed in identifying effective strategies bilingual paraprofessionals can use to harness students' linguistic strengths and promote their literacy skills, as well as their role in meeting students' social emotional and psychological needs. Additionally, more evidence on the effectiveness of different implementation features (e.g., optimal group size, frequency and intensity of supplemental instruction, language scaffolding, family involvement) may provide further guidance to other school and district leaders who are considering hiring paraprofessionals to supplement their core reading instruction and improve student outcomes.

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Table 3.1

School-level Demographic Characteristics (percentages) of First Graders in BIA and Comparison Schools (AY 2018-2019).

							Parent Education			
BIA Schools	N	Female	Avg. Class Size	Latina/o	EL	FRPL	non-HS	HS	Some College	College
BIA School 1	73	57.5	25	100	90.4	93.2	54.8	28.8	16.4	0
BIA School 2	82	43.9	22	100	68.3	87.8	36.6	41.5	18.3	3.7
BIA School 3	69	49.3	24	98.6	75.4	84.1	49.3	37.7	8.7	4.3
BIA School 4	110	56.4	26	98.2	80.9	95.5	50.0	35.5	12.7	1.8
BIA School 5	70	44.3	23	98.6	85.7	94.3	57.1	28.6	10	4.3
BIA School 6	77	48.1	22	100	90.9	94.8	46.8	41.6	9.1	2.6
Overall	481	49.9	24	99.2	81.9	91.6	49.1	35.6	12.5	2.8
Comparison Schools										
Non-BIA School 1[1,3,4,5,6]	70	60.0	26	100	84.3	92.9	42.9	42.9	12.9	1.4
Non-BIA School 2[1,4,6]	96	51.0	25	97.9	88.5	96.9	55.2	35.4	9.4	0
Non-BIA School 3[1,3,4,5]	97	48.5	24	97.9	76.3	90.7	44.3	35.1	13.4	7.2
Non-BIA School 4[1,4,5,6]	47	55.3	20	100	83.0	91.5	61.7	21.3	14.9	2.1
Non-BIA School 5[2,3,4,5]	74	51.4	24	97.3	79.7	98.6	44.6	40.5	12.2	2.7
Overall	384	53.2	23.8	98.6	82.4	94.1	49.7	35.0	12.6	2.7

Note. EL=English Learner; FRPL=free or reduced priced lunch. Comparison schools matched at least one of the BIA schools in all demographic characteristics ($p<0.05$), indicated by superscript numbers. Overall demographic characteristics between BIA and comparison schools did not significantly differ.

Table 3.2

School-level First Grade DIBELS Performance in BIA and Comparison Schools (AY 2018-2019).

	Fall NWF-Correct Letter Sound Scores					Spring ORF Words Correct Scores				
BIA Schools	N	Mean	SD	Range	Percent Scoring Zero	N	Mean	SD	Range	Percent Scoring Zero
BIA School 1	73	31.4	18.7	0-98	2.7	73	47.5	30.3	0-140	4.1
BIA School 2	82	24.7	15.7	0-71	3.7	82	54.3	28.4	0-135	1.2
BIA School 3	69	40.7	29.6	0-143	1.5	69	61.1	36.1	0-146	1.5
BIA School 4	110	26.2	19.3	0-105	3.6	110	42.3	30.5	0-139	0.9
BIA School 5	70	26.2	21.6	0-143	7.1	70	40.2	27.7	6-111	0
BIA School 6	77	21.3	12.7	0-60	1.3	77	44.2	26.6	10-118	0
Overall	481	28.4	19.6	0-143	3.3	481	48.3	29.9	0-159	1.3
Comparison Schools										
Non-BIA School 1[1,2,4,5,6]	70	25.7	17.4	0-100	2.9	70	37.3	28.5	5-104	0
Non-BIA School 2[1,2,4,5]	96	29.2	16.9	3-91	0	96	45.0	31.0	2-107	0
Non-BIA School 3[1,2,4,5]	97	33.6	18.6	3-117	0	97	41.7	31.8	0-127	2.1
Non-BIA School 4[1,3]	47	29.4	20.4	0-123	2.1	47	50.9	36.0	0-143	4.3
Non-BIA School 5[1,3]	74	33.7	21.9	0-110	1.4	74	51.0	28.3	2-115	0
Overall	384	30.3	19.0	0-123	1.3	384	45.2	31.1	0-143	1.3

Note. NWF=Nonsense Word Fluency. ORF=Oral Reading Fluency. Comparison schools matched at least one of the BIA schools in fall of 2018 test scores ($p<0.05$) indicated by superscript numbers. Overall test scores between BIA and comparison schools did not significantly differ in fall or spring.

Table 3.3

CITS Estimates Predicting Schools' Average DIBELS Oral Reading Fluency Standardized Scores in Spring 2019.

	Model 1	Model 2	Model 3
Postprogram Year	-0.304 (0.307)	-0.526 (0.552)	-1.553*** (0.391)
BIA School	0.206 (0.446)	0.070 (0.402)	0.342 (0.412)
Postprogram Year*BIA School[a]		0.409 (0.657)	0.825+ (0.430)
Average Fall DIBELS Nonsense Word Fluency Scores (Standardized)			0.649*** (0.188)
Percent EL (Standardized)			-0.898*** (0.237)
Constant	-0.011 (0.268)	0.063 (0.309)	0.181 (0.291)
N	33	33	33
R-sq	0.032	0.041	0.509

Note. Schools' spring DIBELS performance in 2019 was compared to performance in prior years (2017 and 2018). [a]The impact of the program is represented by the coefficient estimates for the interaction term (Postprogram Year*BIA School) in Models 2 and 3, controlling for schools' fall scores and percent EL each year. Standard error in parentheses.
+$p < .10$ *$p < .05$ **$p < .01$ ***$p < .001$

Table 3.4

Descriptive Statistics for Student-level Analysis.

	Comparison Schools (n=384)				BIA Schools (n=481)				Overall (n=865)	
Variables	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD
DIBELS NWF Scores (Fall)	30.55	19.05	0	123	28.01	20.74	0	143	29.14	20.03
DIBELS ORF Scores (Spring)	44.65	31.17	0	143	47.85	30.69	0	146	46.43	30.93
English Learner	0.82	0.38	0	1	0.82	0.39	0	1	0.82	0.38
FRPL	0.94	0.23	0	1	0.92	0.27	0	1	0.93	0.26
Less than a High School Degree	0.49	0.50	0	1	0.49	0.50	0	1	0.49	0.50
High School Diploma	0.36	0.48	0	1	0.36	0.48	0	1	0.36	0.48
Some College	0.12	0.33	0	1	0.13	0.33	0	1	0.12	0.33
College Graduate	0.03	0.17	0	1	0.03	0.16	0	1	0.03	0.16
Eligible for Special Education	0.08	0.27	0	1	0.12	0.33	0	1	0.10	0.31

Note. NWF=Nonsense Word Fluency. ORF=Oral Reading Fluency. FRPL=Free-Reduced Priced Lunch Status.

Table 3.5

Regression Estimates Predicting First Graders' Spring DIBELS Oral Reading Fluency Scores

	Model 1	Model 2
Fall DIBELS Nonsense Word Fluency Score	0.657*** (0.027)	0.656*** (0.027)
School with BIAs	0.193* (0.088)	0.195* (0.085)
English Learner	-0.119 (0.079)	-0.110 (0.075)
Free-Reduced Priced Lunch Status	-0.075 (0.108)	-0.098 (0.103)
Parent Education Level		
Less than a High School Degree	-0.087 (0.054)	-0.078 (0.053)
Some College	0.048 (0.084)	0.107 (0.075)
College Graduate	-0.148 (0.144)	-0.106 (0.141)
Eligible for Special Education	-0.242* (0.096)	-0.230* (0.097)
Constant	0.116 (0.138)	0.119 (0.133)
N	865	1,009
R-squared	0.464	-

Note. Model 1 includes all first graders within BIA and comparison schools with complete data on key variables and includes cluster-robust (sandwich) variance estimators. Model 2 uses multiple imputation with 20 imputed datasets, thereby analyzing all available cases, and includes cluster-robust variance estimators. Reference group for Parent Education Level are parents with a high school diploma. Fall and spring test scores are standardized. Standard error in parentheses.
$+p < .10$ $*p < .05$ $**p < .01$ $***p < .001$

Table 3.6

Classroom-level descriptive statistics of BIA Classrooms (AY 2018-2019).

Variables	Mean	SD	Min.	Max.
Fall NWF Scores	27.86	8.11	15.90	52.15
Spring ORF Scores	48.18	11.50	26.08	78.35
Percent EL	78.82	12.26	50.00	100.00
Amount of time with BIA (minutes)	121.18	57.00	0.00	200.00
1-1 and 2-1	0.39	0.50	0.00	1.00
Small Group[a]	0.21	0.42	0.00	1.00
Large Group[b]	0.39	0.50	0.00	1.00
Observations	28			

Note. NWF=Nonsense Word Fluency. ORF=Oral Reading Fluency. EL=English Learner.

[a]Small group includes groups of 3-4 students. [b]Large group includes 5 or more students.

Table 3.7

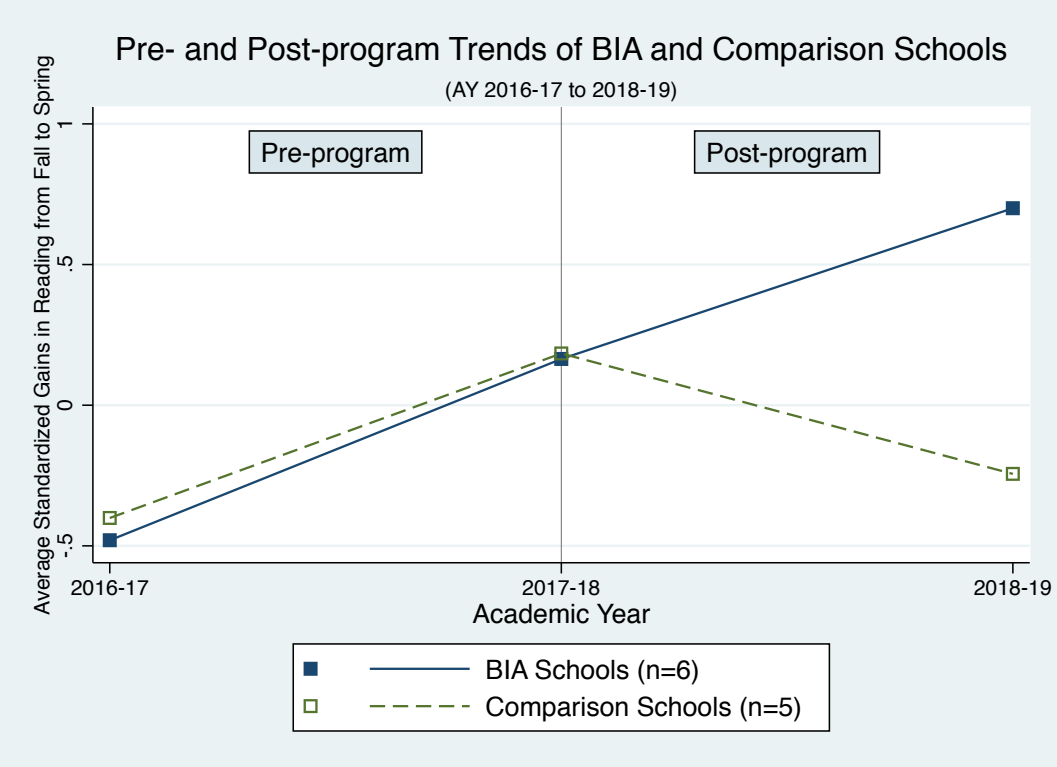
Regression Estimates Predicting BIA Classrooms' Average Spring DIBELS ORF Scores.

	Model 1	Model 2	Model 3
Fall NWF Scores	0.509**	0.655***	0.588***
	(0.147)	(0.124)	(0.118)
Percent EL	-0.387*	-0.265*	-0.163
	(0.147)	(0.122)	(0.124)
Amount of time with BIA (minutes)		0.477***	0.459***
		(0.125)	(0.118)
1-1 and 2-1 Instruction			0.634*
			(0.270)
Small Group Instruction			0.106
			(0.301)
Constant	0.000	0.000	-0.272
	(0.142)	(0.114)	(0.181)
Observations	28	28	28
R-squared	0.478	0.675	0.748

Note. Fall and Spring scores, percent EL, and amount of time were standardized. NWF=Nonsense Word Fluency. ORF=Oral Reading Fluency. The reference group for 1-1 or 2-1 instruction and small group instruction consists of classrooms that primarily provided large group instruction (5 or more students). Standard errors in parentheses. *p<0.05 **p<0.01 ***p<0.001.

Figure 1.1

Pre- and Post-program trends of BIA and comparison schools.



Note. The DIBELS Nonsense Word Fluency subtest is administered in the fall and the Oral Reading Fluency subtest is administered in the spring. Gain scores presented above are standardized.

Appendix A
BIA Questionnaire

Background Information

1. What is your name?
2. What is your racial/ethnic identity?
3. What is the highest level of education you have completed?
4. Do you have any teaching credentials?
5. How many years of classroom teaching experience do you have?
6. Are you fluent in Spanish?
7. Could you please elaborate on your Spanish language abilities and usage? What about in the classroom with students and/or parents?
8. What made you interested in applying for the IA position?
9. What date did you begin working in the school as an IA?

Training

10. Please describe the type and amount of training you have received from the District.
11. Please describe any additional training you have received within the school.

Instructional Assistant duties

12. Are you assigned to one classroom or do you work with students in more than one classroom?
13. Which classroom teacher(s) and grade-levels do you typically assist?
14. List and describe the extent of your duties within each classroom.
15. Do you perform any administrative duties such as making copies, grading, or attendance?
16. Do you interact with the parents of the students?
17. Do you have a set daily schedule or does it change day-to- day?
18. To what extent are you supervised by either School administrators or the teachers you work with?
19. Do you provide whole class, small group, or individualized instruction? Please select all that apply.
20. Please describe the instructional support you provide to students. For example, which subject areas, lesson plans and/or curricula are used for instruction.
21. Are there any other strategies you use when instructing students?
22. How do you feel about the instruction you provide to students?
23. Would you like to continue this position in the next school year?
24. If there was anything you could change or improve as an IA, what would that be?

Appendix B
Time-log Diary (SAMPLE)

Time of day	Brief description of duties
8:00 am-9:10 am	School beings at 8:00AM. I start the day with small group instruction of SIPPS. I continue with lesson 25 with 5 1st graders. For phonological awareness I have them say a word and spell afterwards. For phonics we review our spellings: short vowels, final e, ar, or, -es, and -ed. I also introduce new sounds: "oa-" and "ow(2)." We also have there new sight words: beautiful, true, and blue. We end with dictation of five words and a sentence.
9:10 am-9:20 am	I help students in 1st grade with taking an AR test. I help them read the questions and answers. I spend more time with two students.
9:20 am-10:15 am	I work with the 1st graders in writing four sentences about the Benchmark story "Why Mosquitos Buzz in People's Ears." I spend more time with seven students to ensure they know what to write and to remind them to use transition words. They're telling a sequence of events.
10:15 am-10:30 am	At this time I take my break.
10:30 am-11:05 am	After my break I continue to help three other 1st grade students with their sentences. For one student with Autism, I write out what he wants to say and then he copies it onto his paper.
11:05 am-11:25 am	At this time I help monitor the 2nd graders. I also get the SIPPS lessons ready for both 1st grade groups. I organize the word and sound cards as well.

11:25 am-11:45 am	I make copies of four things: math quiz for 1st grade, HW packets for 2nd , and spelling worksheets for both 1st and 2nd grade.
11:45 am-12:00 pm	I walk around to help 2nd graders type their paragraphs about their opinion papers. They are comparing two characters from two stories. I provide ideas and spelling support.
12:30 pm-12:30 pm	I walk out the 2nd graders to lunch and take my lunch.
12:30 pm-1:40 pm	I work with the 1st graders on their two math pages. A few students require more individual support adding and subtracting tens. I pass out hundreds charts to help them.
1:40 pm-2:04 pm	We pass out Valentines cards and treats. Then, we dismiss the students.

CHAPTER 4

The Role of Bilingual and Dual Language Instruction on the Reading Achievement of Latinx Elementary School Students

Abstract

Providing native language instruction to language minority students is one potential approach for reducing disparities in academic achievement as students can develop academic competence in their first language (L1) while building their English proficiency (L2) skills. This study provides an overview of bilingual and dual language (DL) instructional programs among a nationally representative sample of Latino students using the Early Childhood Longitudinal Study (ECLS-K:2011). First, I investigate the patterns of native language instruction students typically receive, then I examine the child- and school-level characteristics that were most predictive of program enrollment from kindergarten to fifth grade. Factors that were most predictive of selection into these programs were students' Spanish language use at home, English proficiency scores, and parent immigrant status. Finally, I assess the relationship between bilingual and DL instruction from K to 5th grade and students' fifth grade reading outcomes. Findings indicate that each additional year of native language instruction significantly improved students' fifth grade reading scores (ES=.04 SD, $p<.01$), and bilingual instruction provided during the early years was especially beneficial, particularly at kindergarten and first grade. Implications are further discussed.

Keywords: bilingual instruction; dual language instruction; Latino students

Introduction

According to the most recent National Assessment of Educational Progress, only 37% of sampled fourth graders in the U.S. scored at or above 'Proficient' on the reading assessment (NAEP, 2017). Even more concerning are the persistent gaps in academic performance between students of diverse racial and ethnic, linguistic, and socioeconomic backgrounds. For example, Latino students scored significantly lower than their White peers, on average, by about 21 points in reading; English language learners (ELLs) scored significantly lower than their non-ELL peers by about 33 points in reading; and students who were eligible for the National School Lunch Program (NSLP) scored significantly lower than non-eligible students by approximately 28 points in reading.

Additionally, addressing disparities in academic achievement between subgroups of children is imperative because of their potential long-term consequences. Developing strong academic skills during the early school years can result in higher earning potential and better economic opportunities in the long-term (Heckman, Stixrud, & Urza, 2006). Undoubtedly, there are many approaches for reducing the academic achievement disparities between culturally diverse students. Nonetheless, with the passage of the No Child Left Behind Act (NCLB; 2001) and its replacement, the Every Student Succeeds Act (ESSA; 2015), schools remain under increasing pressure to implement school-based solutions for meeting state academic standards. This means that schools and districts are faced with the decision of how best to allocate resources, particularly federally granted resources. This study expands the evidence base by examining the effectiveness of one instructional approach that appears promising for improving the reading achievement of Latino and English Learners (ELs), that is, by providing academic

instruction in students native language during the early elementary grades as they are simultaneously building their English proficiency and literacy skills.

Literature Review

Native language instruction for EL students has long been controversial (de Jong, 2013; Wiese & Garcia, 2001). To take one example, in 1998, voters in the State of California enacted Prop 227 by a 61% popular vote, and this statute required all public schools to instruct EL students exclusively in English. An evaluation of the implementation and impact of Prop 227 revealed that the percentage of students' receiving native language instruction significantly reduced from 30 to 8 percent, and although there was a slight reduction in the achievement gap between ELs and native English speakers, the gap ultimately remained constant in most subject areas at most grade-levels (American Institutes for Research, 2006). Researchers also found no evidence supporting the notion that one type of instructional program (i.e., bilingual vs. English-immersion) was better than the other in improving the performance of EL students. More recently, Prop 58, the Multilingual Education Act in California, repealed Prop 227, now allowing public schools to incorporate bilingual education in their instructional programs.

Following California's lead, in the year 2000, Arizona enacted its own English-only (EO) law, Prop 203, and Massachusetts similarly passed Question 2 in 2002, which also required the exclusive use of English in public school classrooms (Gándara & Hopkins, 2010). Yet, the evidence on the effectiveness of these policies in reducing achievement gaps between EL students and their native English-speaking peers is quite limited. Further, the increase in state accountability standards resulting from NCLB occurred around the same time as the passage of these EO laws (Wright & Choi, 2006), so it remains unclear whether any changes in the

academic performance of EL students during this time period were the result of EO-laws or state accountability standards.

Nevertheless, these policies shape the preparation of teachers, their professional development, and classroom instructional practices (de Jong, Arias, & Sánchez, 2010). Reviewing the impact of native language instruction on student outcomes is thus necessary for discerning the scientific rationale behind such restrictive language policies.

Native Language Instruction

The National Literacy Panel on Language-Minority Children and Youth was created in 2002 by the Institute of Education Sciences for the purpose of investigating the literacy development, cross-linguistic relationships, sociocultural contexts, professional development, instruction, and assessment practices related to the literacy development of second-language learners (August & Shanahan, 2006). Regarding the relationship between native language use and the educational outcomes of second-language learners, researchers have suggested that the use of students' native languages for instruction can promote reading achievement in English (August, Goldenberg, & Rueda, 2010).

Native language programs are commonly known as bilingual education or dual language programs. These types of programs vary in terms of their goals and curricular structure, and they are typically categorized into three main instructional models depending on the program's goals (i.e., transitional bilingual, maintenance or developmental bilingual, and dual language or two-way immersion programs). Transitional bilingual programs focus on quickly transitioning EL students to English-immersion programs in 2-3 years (from K-2 or K-3) and are also known as "early-exit bilingual programs". These programs utilize the home language to support students' English language acquisition and access to academic content. Developmental or maintenance

bilingual programs, also known as "late-exit bilingual programs", gradually introduce the English language while simultaneously focusing on building students' native language skills. These programs typically last longer (5-7 years) and prioritize developing students' bilingualism and biliteracy. Dual language or two-way immersion programs are like traditional bilingual programs, though they differ in the types of students they serve. Students in these two-way programs include EL students who speak the target language of the program, as well as native English-only speakers, and the goal of these programs is for both groups of students to develop proficiency in the target language and English (Osorio-O'Dea, 2001).

In a best evidence synthesis, Cheung and Slavin (2012) reviewed research on the impact of language of instruction on the academic performance of Spanish-dominant ELs. Across 13 studies that met their inclusion criteria, they found a positive, though modest, effect of bilingual vs. English-immersion programs (ES=0.21, $p<0.01$); however, effect sizes varied between the type of study design used (i.e., matched-control vs. randomized), and the type of bilingual program tested (i.e., paired bilingual, dual language, and transitional). Additionally, only 2 of the included studies appeared in peer-reviewed journals, 2 were longitudinal evaluations, and 10 were written in the 1970s. Given the mixed evidence in their review, Cheung and Slavin (2012) concluded that the quality of instruction matters more than the language of instruction, and effective instructional strategies include small group or one-to-one phonics instruction, as well as ongoing professional development support for educators providing reading instruction to ELs.

Regarding the two longitudinal evaluations, one favored bilingual education among a sample of Spanish-speaking Mexican American children (n=47) who received Spanish instruction from first to fourth grade (Maldonado, 1977). These children were compared to a group of matched controls (n=79) who were enrolled in English-only classrooms. There were no

statistically significant differences between the control and experimental groups at fifth grade, though the overall effect size was 0.11 favoring bilingual education. It may be important to note that teachers in the control condition were reported as being bilingual, so it is unclear whether Spanish use in the control classrooms was accounted for.

The other longitudinal evaluation included in the Cheung and Slavin (2012) review found no significant differences in fourth-grade English reading performance between students who were randomly assigned to either transitional bilingual or English-immersion programs during their kindergarten year (Slavin et. al., 2011). Students in bilingual programs transitioned to English-immersion (EI) programs by first or second grade, and students in EI programs received occasional guidance in Spanish. Because students in this study exited bilingual programs early on, less is known about the impact of providing ongoing native instruction throughout the elementary grades on later reading performance at the end of 5th grade.

Umansky and Reardon (2014) further investigated the reclassification patterns of Latino EL students enrolled in dual language, maintenance bilingual, transitional bilingual, and English immersion programs. Using reclassification patterns is useful for evaluating the effectiveness of language programs because reclassification reflects students' performance on English proficiency measures, and English proficiency skills are essential for reading comprehension. Authors found that students in two-language programs were initially reclassified at lower rates in elementary school, but by the end of high school, had higher reclassification rates, English proficiency skills, and academic ELA achievement than their peers in English-immersion programs. These findings also call attention to the importance of longitudinal investigations considering the amount of time that is necessary for students to build adequate language proficiency skills in their L2 (Hakuta, Butler, & Witt, 2001).

More recently, Steele and colleagues (2017) have provided causal estimates of dual language program enrollment on the academic performance and reclassification rates of native speakers of languages other than English, as well as on the academic performance of native English speakers. Participants in their study included seven cohorts of students within a district in Portland, Oregon who applied for a dual immersion program slot through a lottery process prior to entering their pre-k or kindergarten year in the fall of 2004 to 2010. Intent-to-treat (ITT) effects found that lottery winners outperformed their peers by 0.13 SD and 0.22 SD on the 5th and 8th grade state-mandated English reading tests, respectively. They also used instrumental variables (IV) analyses to obtain treatment on the treated (compliers) causal estimates and found large significant effects of dual language immersion on reading achievement (approximately 0.20 to 0.50 SD from 3rd to 8th grade), and these estimates were similar for native and non-native English speakers. Also, ELs in dual immersion programs were 6 percentage points less likely to be classified as an EL at fifth grade and 14 percentage points less likely at sixth grade. There were no statistically significant differences in math or science performance. Again, these findings highlight the importance of longitudinal evaluations of bilingual and dual language programs on the long-term reading achievement of Latino students and ELs.

Overall, researchers have found no detrimental effects of providing Spanish-dominant EL students with academic instruction in their native language, with several positive findings favoring bilingual instructional programs over English-immersion programs. Nevertheless, bilingual programs tend to differ in their structures, curricular goals, the students they serve, and the amount of linguistic support provided to students. Also, less is known about which instructional practices within these programs most effectively promote the reading achievement

of second-language learners. In the following section, I review several theoretical frameworks to outline the role native language instruction might play in ELs' reading development.

Developmental Models of Reading

According to the Simple View of Reading (Gough & Tunmer, 1986), the primary skills necessary for reading comprehension are decoding (i.e., word reading) and linguistic comprehension, or understanding the words that are read. Building on Gough and Tunmer's (1986) Simple View of Reading model, Kim (2017, 2019) further unpacks the relationships and pathways between a range of language and cognitive skills (e.g., working memory, vocabulary and grammatical knowledge, knowledge-based inference, perspective-taking, and self-monitoring) and reading comprehension. Specifically, using a framework called the direct and indirect model of reading (DIER), she uses structural equation modeling to assess the direct and indirect effects these components skills have on reading comprehension. For instance, the primary skill of word reading in the Simple View of Reading encompasses phonological, morphological, and orthographic awareness. Likewise, listening comprehension involves foundational language skills and higher-order cognitive skills. Across her studies, word reading and listening comprehension completely mediated the relationship between component skills and reading comprehension skills lending further support to the Simple View of Reading. However, the DIER model proposes that word reading and listening comprehension are upper-level skills that are predicted by foundational cognitive and language component skills.

Another theoretical framework is Cummins interdependence hypothesis (1979), which proposes that the development of competence in a second language (L2) is partly dependent on the development of competence in the first language (L1). This interdependence hypothesis has been a catalyst for research examining the cross-linguistic relationships between component

skills in reading across a wide variety of languages (Genesee, Geva, Dressler, & Kamil, 2006). Of course, not all component skills are equally transferable— for example, Cummins' interdependence theory posits that a threshold amount of L2 proficiency is needed for students to benefit from their L1 skills. Nonetheless, studies investigating cross-linguistic relationships continue to indicate which component reading skills are more easily transferable across languages than others.

Furthermore, Perfetti and Dunlap (2008) postulate that the reading process is embedded within the phonology of language and its writing system based on the Universal Phonological Principle and Language Constraint on Writing Systems Principle. Therefore, according to this logic, component reading skills, such as phonological awareness and print awareness, may transfer across languages, but transferability will vary depending on the writing systems of languages (e.g., alphabetic, logographic, syllabic), their orthographic depth, and instruction.

Indeed, cross-language transfer has been found between some Spanish and English reading skills. For instance, two studies found that the Spanish reading skills of Spanish-English bilingual kindergarteners significantly predicted their English reading skills at subsequent grade-levels, even after controlling for English measures (Páez & Rinaldi, 2006; Relyea & Amendum, 2019). Goodrich, Farrington, and Lonigan (2016) also found that the writing skills of Spanish-English bilingual preschoolers were significantly related across their languages, and Spanish print knowledge and vocabulary were also significantly related to English invented spelling. Although this is not a comprehensive review of the literature on cross-language transfer, these findings are suggestive of the potential benefits of Spanish literacy instruction in the early grades on later reading achievement, particularly for young Spanish speaking students who are still developing their English language skills at the start of formal schooling.

Current Study

In this study, I evaluate the relationship between the amount of bilingual and dual language (DL) instruction students received throughout elementary school and their spring of fifth grade reading outcomes among a nationally representative sample of Latino elementary school students. This study builds on prior work by expanding the evidence-base in the following ways: (1) I explore the patterns of treatment (i.e., bilingual or DL instruction) students received throughout elementary school to outline the typical structure of these programs nationwide, (2) I examine which student, family, and school characteristics are most predictive of whether a student received bilingual or DL instruction from kindergarten to fifth grade, (3) I provide estimates for the relationship between bilingual or DL instruction provided throughout elementary school on Latino students' 5th grade reading achievement, and (4) I provide causal estimates for the impact of bilingual or DL instruction on Latino students reading outcomes. The following research questions are addressed, (1) What are the patterns of treatment (i.e., bilingual or DL instruction) students received throughout elementary school? (2) To what extent are child, family, and school characteristics significantly predictive of whether a student received bilingual or DL instruction from kindergarten to fifth grade? (3) What is the relationship between bilingual or DL instruction from kindergarten to fifth grade and students' fifth grade reading outcomes, controlling for a range of child-, family-, and school-level characteristics? (4) What is the impact of bilingual or DL instruction on the reading performance of Latino students?

Method

Data

In this study, I conduct secondary data analysis using the Early Childhood Longitudinal Study: 2010–2011 (ECLS-K:2011). The ECLS-K:2011 is a nationally representative dataset of

U.S. children who entered kindergarten in the fall of 2010 and were followed until academic year 2015-2016 when most children were in the fifth grade. The ECLS sample was selected using a complex multi-stage, stratified, clustered survey design where observations were clustered within primary sampling units (PSUs). Thus, appropriate weights were applied to ensure the data was representative of the population (see Analytic Design below).

This dataset is sponsored by the National Center for Education Statistics (NCES) housed within the U.S. Department of Education (Tourangeau et al., 2018). Data collected included child-level data, including measures of academic, health, and social emotional outcomes, as well as family- and school-level data collected through a series of interviews and questionnaires. More information can be found on the website (http://nces.ed.gov/ecls).

Participants

Nearly 4,600 Latino children were identified in this dataset out of the 18,100 total sampled and were included in this study. Latino children (n≈2,900) with complete data on the bilingual variables (i.e., bilingual or DL instruction at each grade-level) were used to explore the patterns of treatment these students received throughout elementary school (RQ1). Those with complete data on the bilingual variables and all covariates (n=1,100) were used to model selection into bilingual or DL programs (RQ2). As a further robustness check on these results, full information maximum likelihood (FIML) was used to account for missing data and make use of all available cases. I conducted a linear probability model, which uses ordinary least squares (OLS) regression with a binary outcome variable (1=bilingual or DL instruction at each year) to model selection into bilingual or DL programs. The final analysis sample (n≈4,600) was also used in FIML regression analysis to analyze the relationship between bilingual instruction and students' fifth grade reading outcomes (RQ3).

Descriptive statistics for the FIML analysis sample are found in Table 4.1. The sample consisted of about 51% male students, and about 57% of children received center-based care prior to kindergarten. The average age at the fall of kindergarten assessment was about 67 months, and nearly 57% of children's parents were immigrants. About 69% of families spoke Spanish at home. At the kindergarten wave of data collection, most parents received less than or at most a high school diploma (33% and 28%, respectively). The average family income level was between $30,000 and $35,000, and the average household size was about 5 people. Also, about 80% of students, on average, attended schools that received Title I funds. Only 14% of students received bilingual or DL instruction at kindergarten, and this percentage decreased by 1-3% each year up to fifth grade.

Measures

Oral Language Skills

Students' basic oral English language skills were assessed in the fall and spring in kindergarten and first grade using the Preschool Language Assessment Scale (*pre*LAS, 2000). For Spanish-speaking children, the *pre*LAS served as an English language screener and students who scored a 12 or below out of 20 were given the remainder of the assessments in Spanish. Nearly all children were routed through the English assessments by the spring of first grade, so data collection on this measure was discontinued in the second grade and beyond. This instrument has been validated with a sample of Spanish-speaking children (Rainelli et. al., 2017).

Reading Scores

Reading skills were assessed in the fall and spring of kindergarten and every spring thereafter. The reading assessment measured students' basic reading skills, such as word recognition, vocabulary, and reading comprehension. Students were first routed through a set of

12-items, and their performance on these items determined the assessment form (low, middle, or high difficulty) they received during the second-stage test. Controlling for prior achievement, student's item response theory (IRT) scores from fifth grade were used as the primary outcome measure.

Bilingual or Dual Language Instruction

During each wave of data collection, teachers reported the type of language instructional program (i.e., dual language/bilingual or English-Only) that each student participated in. I combined these variables to indicate the total amount of bilingual or DL instruction students received throughout elementary school ranging from 0-6 years. These language instructional variables were used as the primary explanatory variables in regression analyses (outlined below).

Covariates

To control for variation in students' immigration histories, linguistic backgrounds, and home environments, several child-level covariates were included in the FIML regression models. These variables were measured during the kindergarten year and included the child's sex (1=Male), whether they attended center-based care prior to kindergarten (1=center-based care), their age at the fall of kindergarten assessment in months, parent's immigrant status (1=Parent Immigrant), parent's highest level of education and income level, household size, and whether the child was routed through the Spanish reading assessment at the fall of kindergarten (1=Routed through Spanish Assessments). A series of 5 dummy variables were used to represent parent's highest education level (1=Less than high school, high school, some college or vocational training, bachelor's degree, and graduate or professional degree). Family income level ranged from 1 ($5,000 or less) to 18 ($200,001 or more). To capture the academic stimulation

provided to children in the home, the number of books in the home (log-transformed) and whether the family visited the library were also included.

Language use in the home was also accounted for using a series of language variables, including whether Spanish was spoken in the home (1=Spanish home), how often parents spoke to the child in Spanish at home and vice versa, and parent's self-reported English proficiency. For parent English proficiency, parents were asked a series of questions on how well they could read, write, speak, or understand English using a 4-point scale from 1=Not Well At All to 4=Very Well. These were combined to create an overall proficiency score ranging from 4=Very Low Proficiency to 16=Very high proficiency. Parents also reported how often each parent spoke to the child in Spanish at home and vice versa using a 4-point scale from 1 indicating they never spoke to them in Spanish to 4 indicating they spoke to them often in Spanish.

Family income level and child's age at assessment were used as covariates in the student FE analysis since these were time-varying variables that were consistently measured every year.

Analytic Design

I began by creating a table displaying the 64 possible patterns of treatment (i.e., bilingual or DL instruction from kindergarten to fifth grade) with the corresponding number and percentages of students receiving different configurations of the treatment (0, 1) for the six years they were in school (2 x 2 x 2 x 2 x 2 x 2 = 64 possible patterns). This table outlines the typical patterns of treatment for those students with complete data on the treatment variable (RQ1), and it reveals the amount of bilingual instruction students received among this nationally representative sample of Latino children. This is found in Table 4.2.

Next, logistic regression was used to predict students' participation in a bilingual or dual language vs. English-immersion program (1=BILINGUAL) at each wave with student-, family-,

and school-level characteristics serving as independent variables. The logistic model is like a linear probability model but the logistic curve limits possible y-values between 0 and 1. This prediction curve is denoted by equation 1.1 below,

$$p = \frac{1}{1+ e^{-(b_0+b_1X_1+b_2X_2+\cdots+b_kX_k)}} \qquad (4.1)$$

where p is the probability of being in a bilingual program, the *X*'s are is predictor variables, and k is the number of variables in the model. The logistic regression transforms the resulting probability into corresponding log-odds, or logits, and this logit transformation is a linear function of the predictor variables without restricting the range in y-values (See equation 4.2). This means that the log-odds can range between negative and positive infinity making this transformation more easily interpretable.

$$ln(\frac{p}{1-p}) = b_0 + b_1X_1 + b_2X_2+\ldots+b_kX_K \qquad (4.2)$$

The beta coefficients in the logit-transformed probability model can be interpreted as an odds-ratio which is the amount the log-odds changes with a one-unit change in *X*. I complemented this analysis using a linear probability model and the SEM command in STATA to account for missing data while also adjusting for the clustering of schools. These analyses address the second research question by highlighting the student-, family-, and school-level characteristics that are significantly predictive of students' participation in bilingual or dual language programs from kindergarten to fifth grade.

To further assess the relationship between participation in a bilingual program and students' outcomes, a series of regressions were conducted. First, I estimated the relationship between bilingual instruction received from kindergarten to fifth grade and students' fifth grade reading outcomes (RQ3). I estimated this by full information maximum likelihood (FIML) using the SEM command in STATA to account for missing data and make use of all available cases.

Allison (2001) explains that FIML is an optimal method for dealing with missing data. This is represented by the following general equation,

$$y_i = \beta_1 \text{BILINGUAL}_i + \beta_2 \text{PRELAS}_i + \beta_2 \text{PRE\_READ}_i + \beta_K \text{X}_{Ki} + u_{it} \quad (4.3)$$

where y is the spring of fifth grade reading outcome for student i; BILINGUAL is a series of 6 dummy variables for whether or not the student received bilingual instruction in each of grades K-5; PRELAS_i is the fall of kindergarten prelas score for student i; PRE_READ_i is the fall of kindergarten reading score for student i; X_{Ki} is a vector of covariates (listed above) for student i; and u_{it} is an error term. β_1 is the estimate of the effect of bilingual instruction at each grade level on fifth grade reading outcomes. Additionally, in a separate regression model, a continuous variable representing the total number of years students received bilingual or DL instruction throughout elementary school was also used in place of the dummy variables. Standard errors were also adjusted to account for non-independence and the clustering of students within schools. I also applied child weights and accounted for survey features in the data, though the FIML analysis resulted in more conservative estimates, so findings from the FIML analysis are reported below. Although the FIML analysis makes use of all available cases, it is subject to selection bias due to the nature of selection into these programs, so I address this concern by conducting student FE analysis (discussed below).

Next, I investigated the overall impact of bilingual or DL instruction at each year on students' reading outcomes (RQ4). I estimated this by conducting pooled OLS regression with student fixed effects (FE) using the following general equation,

$$y_{it} = \beta_1 \text{BILINGUAL}_{it} + \beta_2 \text{INCOME}_{it} + \beta_3 \text{AGE}_{it} + \gamma \text{WAVE}_t + \alpha_i + u_{it} \quad t=1, 2, \ldots, T. \quad (4.4)$$

where y is the spring reading outcome for student i at time t; BILINGUAL is a continuous variable for the number of years of bilingual instruction student i received at time t; INCOME is

a continuous variable for the student *i*'s family income level at time *t*; AGE is a continuous variable for student *i*'s age at assessment at time *t*; γWAVE$_t$ is a vector of indicators for each wave of data collection; u_{it} is an error term; and α_i is student FE. β_1 is the pooled estimated effect of bilingual instruction on students' reading outcomes. Fixed effects estimation removes the effects of any unobserved characteristics, or omitted variables, of the participants in the study (Wooldridge, 2009). Conceptually, any child-level characteristics that are time-invariant, meaning they are fixed over time, are differenced out of the regression equation to provide a more precise estimate of the relationship between enrollment in a bilingual program and students' subsequent reading performance.

Important to note is that within FE estimation, participants serve as their own controls, so the estimated impact of participation in a bilingual program represents the pooled effect this predictor has on an individual students' outcomes each year that they did and did not receive bilingual instruction from kindergarten to fifth grade. This *within* estimation may be imprecise for estimating time-varying variables (i.e., participation in a bilingual program) that vary little over time, and the impact of bilingual instruction may not appear until much later when students are no longer receiving such instruction. Thus, I used a continuous variable in place of the binary variable for bilingual instruction to estimate the effect of the total number of years students received bilingual or DL instruction at each wave in the student FE analysis to account for varying amounts of bilingual instruction students received in prior years.

Results

Out of the nearly 2,000 Latino students with complete data on the treatment variable (i.e., bilingual or dual language instruction at each year), 80% did not receive any native language instruction throughout their elementary school years (See Table 4.2). This means only 20% of

the sample received any bilingual instruction during grades K-5. Of those who did, the most common pattern (3.9% of the total sample) received this instruction every year. The next most prevalent pattern (1.7% of the total sample) received it every year from K-3rd. Following this in frequency (1.6% of the total sample) received it every year in K-2nd grade and following this (1.3% of the total sample) received it in just kindergarten and first grade. Other patterns were even less frequent.

Table 4.3 presents the results from the logistic regression predicting participation in a bilingual or dual language program from kindergarten to fifth grade with child-level and school-level variables serving as predictor variables. I show odds ratio coefficients, in which values below 1.0 indicate a negative relationship while those above 1.0 indicate a positive relationship. Because the results from the logistic regression are more easily interpretable than those from the linear probability model, I report these findings, though both sets of results were largely consistent. For those students with complete data on all variables (n=1,100), the variables that were significant predictors of bilingual instruction at nearly every year were fall of kindergarten prelas scores, parent immigrant status, family income level, amount the child spoke Spanish at home, whether the school received Title I funds, percent Latino, and percent EL. Results from the linear probability model utilizing FIML analysis can be found in Appendix C (Table 4.1).

Students with higher English language scores at the start of kindergarten as measured by the prelas were 46-57% less likely to participate in bilingual programs from kindergarten to fifth grade. Additionally, those with higher family incomes were 35-48% less likely to participate in bilingual programs from kindergarten to 2nd grade, though income level was not a significant predictor from 3rd to 5th grade. Students within schools with higher percentages of ELs were also 32-51% less likely to participate in these programs from K to 5th grade.

Alternatively, students of parents who were immigrants were 90-130% more likely to receive native language instruction from K to 4th grade and 260% more likely at 5th grade. Likewise, students who spoke greater amounts of Spanish at home were 72-224% more likely to receive bilingual instruction from kindergarten to fifth grade. The greatest predictors of participation in bilingual or dual language programs were school-level variables (i.e., those that received Title I funds and percent Latino). Students within schools receiving Title I funds were 1,000-1,400% more likely to receive bilingual instruction at kindergarten and 1st grade, and 700% more likely at 2nd grade. I, thus, tabulated the bilingual dummy variables with the Title I variable, which revealed that only 3-6 students receiving bilingual instruction at each year were not in Title I schools, meaning that nearly all students receiving bilingual instruction did attend Title I schools. Also, students within schools with higher percentages of Latino students were 230-377% more likely to receive native language instruction from K to 5th grade.

Table 4.4 presents the results from the FIML regressions predicting students' 5th grade reading scores (RQ3). After controlling for students' fall of kindergarten prelas and reading scores, as well as child-level and school-level covariates, the total amount of bilingual instruction students received throughout their elementary school years significantly predicted their 5th grade reading scores (Model 2). Specifically, each additional year in the total number of years students received native language instruction resulted in a 0.042 SD increase in reading scores at the end of 5th grade ($p<.01$), even after controlling for a range of child, family, and school characteristics, as well as prior reading test scores and English proficiency scores. This means that regardless of students' socioeconomic backgrounds (i.e., family income level and parent education level) and their language status background (i.e., their preLAS scores and the amount they spoke Spanish at home with their parents), those who received more native language instruction from grades K-5

significantly benefitted from these programs and had higher reading scores at the end of 5th grade. This finding was further supported by the student FE analysis (Table 4.5), which revealed that bilingual or DL instruction had an overall positive impact on students' reading performance (ES=0.04, p<.10), though this was a marginally significant finding.

Additionally, Model 4 in Table 4.4 includes six dummy variables of bilingual instruction at each year and indicates that bilingual or dual language instruction at 1st grade has the largest positive coefficient, which is marginally significantly predictive of reading scores at the end of 5th grade (b=0.156, p<.10), suggesting that bilingual or dual language instruction is likely most beneficial in first grade. However, bilingual instruction at other years did not significantly predict reading scores at the end of elementary school, and bilingual instruction at 4th grade negatively predicted 5th grade reading scores (b=-0.172, p<.10), though this was also a marginally significant finding.

I, then, performed post-hoc FIML analyses to examine the relationship between each year of bilingual instruction from K-5th grade and students' subsequent reading outcomes by including the bilingual instruction dummy variables separately for each year rather than altogether in the regression model. Findings from these results are found in Appendix D-F, Tables 4.2-4.4. These results revealed that bilingual instruction provided during the early grades, particularly K-1st, significantly predicted students' 4th and 5th grade reading outcomes. Students who received bilingual instruction at kindergarten significantly outperformed their peers by 0.205 SD (p<.001) and 0.174 SD (p<.001) at 4th and 5th grade, respectively. Students who received bilingual instruction at 1st grade significantly outperformed their peers by 0.187 SD (p<.001) and 0.191 SD (p<.001) at 4th and 5th grade, respectively. Also, students who received bilingual instruction at 2nd grade outperformed their peers by 0.091 SD (p<.10) and 0.104 SD

($p<.10$) at 4th and 5th grade, respectively, though these results were marginally significant. Bilingual instruction at 3rd, 4th, and 5th grade did not significantly predict subsequent outcomes.

Discussion

Schools and districts with significant numbers of Latino and Spanish speaking students, as well as researchers and policymakers, are particularly interested in the significance of providing students with native language instruction as this is one potential approach for reducing disparities in their academic achievement. Nonetheless, more research assessing the relationship between bilingual or dual language instruction and students' long-term outcomes is necessary for evaluating the scientific evidence for the benefits of these programs. The current study expands the evidence base on bilingual instruction using a nationally representative sample of Latino elementary school students and provides descriptive information about the patterns of "treatment" students typically receive, as well as the student- and school-level characteristics that are predictive of bilingual or dual language instruction throughout elementary school.

Results examining the patterns of treatment indicated that most children in this sample who received bilingual or dual language instruction likely received it beginning in kindergarten, and depending on school and child characteristics, continued to receive native language instruction until they exited out of the program. It was less common for students to receive bilingual instruction from 1st to 5th grade if they had not already received it in kindergarten or if they had already stopped receiving it at an earlier year. This finding is one of the first to outline Latino students' typical instructional experiences of native language programs nationwide.

However, less is known about why students stopped receiving native language instruction after kindergarten. Some possible explanations are that students might have tested out of these programs after meeting English proficiency standards, some schools may have only provided

these programs in the early grades due to funding limitations, or the structure of these programs were truly reflective of transitional bilingual programs where students exited out of these programs at a particular grade-level. It remains probable that each of these explanations are true to some degree, though this cannot be determined due to the limitations of the dataset.

Nonetheless, results from the logistic regressions predicting selection into bilingual programs revealed some consistency in terms of the child and school characteristics that were most predictive of whether a student received bilingual or dual language instruction at each grade-level. As expected, students' language status, background, and usage were significant predictors of bilingual instruction at every year even above other individual-level factors. Not surprisingly, students who scored higher on the preLAS, indicating stronger oral English language ability, were significantly less likely to receive bilingual or dual language instruction. This was a very strong effect at all grade levels, with odds ratio coefficients around .4-.5. The two other individual-level predictors that were statistically significant at all grade levels were whether the parent was an immigrant and the amount the child speaks the native language. These positive effects on bilingual instruction are to be expected, since they tend to indicate the extent to which students were concentrated in their native language. School-level predictor variables were also statistically significant.

Another notable finding was that nearly all students in bilingual programs in the early grades attended schools that received Title I funds. This calls attention to the importance of federal funding in supplying schools, especially those with large percentages of Latino and Spanish speaking students, with enough resources to implement these native language instructional programs. This finding also highlights which students are primarily selecting into these programs (i.e., those from low-income backgrounds). Thus, it is important to account for

these characteristics when assessing the impact of bilingual instruction on student outcomes to reduce selection bias issues.

After controlling for child- and school-level characteristics, the FIML regressions assessing the relationship between bilingual instruction at each year and 5th grade reading outcomes and the post-hoc FIML analyses revealed that native language instruction seemed to be most positively impactful during the early grades, particularly during kindergarten and first grade. Nonetheless, when combining the total number of years students received bilingual or DL instruction throughout elementary school, for each additional year of bilingual instruction, students' 5th grade reading scores increased by .04 SD, and this was statistically significant at $p < .01$. The results from the student FE analysis also aligned with the FIML analysis and provided causal estimates of the impact of native language instruction on student outcomes while also addressing selection bias issues.

Study Limitations

There were at least two limitations to this study. First, one limitation of the study was the lack of information regarding the types of bilingual and dual language programs students received. Due to limitations in the dataset, the structure of these programs (e.g., distribution of Spanish and English language instruction), content covered, curricula used, and program goals (e.g., developing biliteracy or focusing solely on building English proficiency) were unknown, however, this information would be necessary to replicate study findings and increase generalizability. Nevertheless, this study includes a nationally representative sample of Latino students, which provides an overview and general description of the percentage of students receiving this type of instruction, typical patterns of treatment, and evidence on the effectiveness of these programs nationwide.

Lastly, in this study, I focus on reading outcomes, though examining the relationship between bilingual instruction and other academic outcomes, such as mathematics and science achievement, as well as social emotional outcomes would be useful and would further expand the evidence on the effectiveness of native language instruction.

Conclusion

Overall, findings from this study highlight the potential benefits of bilingual and dual language instruction, particularly during the early years, on Latino students' later reading outcomes. Although bilingual instruction at later years (i.e., 2nd though 5th grade) did not result in significant positive effects on student's end-of-fifth grade reading outcomes, the total number of years students received this instruction resulted in statistically significant, positive results. Thus, these findings suggest that providing Latino students with native language instruction throughout their elementary school years could positively impact their reading scores in comparison to their peers who receive English-only instruction, which is one potential approach for reducing disparities in academic achievement between Latino students and their non-Latino peers.

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Table 4.1

Descriptive statistics for FIML analysis sample (n≈4,600)

Variables	Mean	SD	Min	Max
Fall of Kindergarten Reading	50.30	9.66	33.14	107.71
Fall of Kindergarten *pre*LAS	16.32	4.82	0	20
Male	0.51	0.50	0	1
Age at Kindergarten-entry (Months)	66.89	4.34	50.43	85.08
Had Center-based Care Before Kindergarten	0.57	0.50	0	1
Parent Immigrant	0.57	0.49	0	1
Parent Education				
Less than H.S.	0.33	0.47	0	1
H.S.	0.28	0.45	0	1
Some College or Vocational Training	0.25	0.43	0	1
Bachelor's Degree	0.10	0.30	0	1
Graduate Degree	0.04	0.20	0	1
Income Level	7.56	5.04	1	18
Household Size	4.89	1.56	2	15
Spanish Spoken at Home	0.69	0.46	0	1
Amount Caregiver Speaks Spanish at Home	2.74	2.32	0	6
Amount Child Speaks Spanish at Home	2.24	2.23	0	6
Caregiver Self-Reported English Proficiency	12.55	4.36	4	16
Number of Books at Home (Log-transformed)	3.24	1.16	0	8.02
Family Visits the Library	0.53	0.50	0	1
Child Routed through Spanish Assessment at K-entry	0.09	0.28	0.00	1
School-level Variables				
Received Title I Funds	0.80	0.40	0	1
Percent Latino	51.64	33.22	0	100
Percent English Learner	29.73	25.94	0	100
Percent Free or Reduced Priced Lunch	68.54	30.06	0	100
Treatment Variables				
Bilingual or DL Instruction in Kindergarten	0.14	0.34	0	1
Bilingual or DL Instruction in 1st grade	0.12	0.33	0	1
Bilingual or DL Instruction in 2nd grade	0.11	0.32	0	1
Bilingual or DL Instruction in 3rd grade	0.11	0.31	0	1
Bilingual or DL Instruction in 4th grade	0.08	0.27	0	1
Bilingual or DL Instruction in 5th grade	0.07	0.26	0	1
Total Years of Bilingual or DL Instruction	0.46	1.26	0	6

Note. DL=Dual language. All continuous variables were standardized for regression analyses.

Table 4.2

Patterns of bilingual or dual language instruction from kindergarten to 5th grade for students with complete data on treatment variables (n=1,916)

Pattern	Kindergarten	1st	2nd	3rd	4th	5th	Total (n)	%
1	0	0	0	0	0	0	1,535	80.11
2	1	1	1	1	1	1	75	3.91
3	1	1	1	1	0	0	33	1.72
4	1	1	1	0	0	0	31	1.62
5	1	1	0	0	0	0	25	1.30
6	1	1	1	1	1	0	23	1.20
7	1	0	0	0	0	0	23	1.20
8	0	0	0	0	0	1	12	0.63
9	1	1	0	1	0	0	11	0.57
10	0	0	1	0	0	0	11	0.57
11	1	0	0	1	0	0	10	0.52
12	0	1	0	0	0	0	9	0.47
13	1	0	1	1	1	1	8	0.42
14	1	1	0	1	1	1	7	0.37
15	0	1	1	1	1	1	7	0.37
16	1	1	1	1	0	1	6	0.31
17	1	0	0	1	1	1	6	0.31
18	1	1	1	0	1	0	6	0.31
19	1	0	0	1	0	1	6	0.31
20	0	0	0	0	1	0	6	0.31
21	1	0	1	1	0	0	5	0.26
22	1	0	1	0	0	0	5	0.26
23	0	0	0	1	0	0	5	0.26
24	1	1	1	0	1	1	4	0.21
25	1	0	1	0	0	1	4	0.21
26	0	1	1	0	0	0	4	0.21
27	1	1	0	1	0	1	3	0.16
28	1	0	1	1	0	1	3	0.16
29	1	1	0	0	1	0	3	0.16
30	1	0	0	0	1	0	3	0.16
31	1	0	0	0	0	1	2	0.10
32	0	0	0	1	1	1	2	0.10
33	1	0	1	1	1	0	2	0.10
34	1	0	0	1	1	0	2	0.10
35	0	1	1	1	0	0	2	0.10

Table 4.2 (continued)

Pattern	Kindergarten	1st	2nd	3rd	4th	5th	Total (n)	%
36	0	1	0	1	0	0	2	0.10
37	0	0	1	1	0	0	2	0.10
38	1	1	1	0	0	1	1	0.05
39	1	1	0	0	1	1	1	0.05
40	0	0	1	1	1	1	1	0.05
41	1	1	0	1	1	0	1	0.05
42	1	0	1	0	1	1	1	0.05
43	0	1	1	1	0	1	1	0.05
44	0	1	1	1	1	0	1	0.05
45	1	0	1	0	1	0	1	0.05
46	0	0	1	1	0	1	1	0.05
47	0	0	1	1	1	0	1	0.05
48	0	1	0	0	0	1	1	0.05
49	0	0	1	0	1	0	1	0.05
50	0	0	0	1	1	0	1	0.05
51	1	1	0	0	0	1	0	0
52	1	0	0	0	1	1	0	0
53	0	0	0	0	1	1	0	0
54	0	1	1	0	1	1	0	0
55	0	1	0	1	1	1	0	0
56	0	1	0	0	1	1	0	0
57	0	1	1	0	1	0	0	0
58	0	1	1	0	0	1	0	0
59	0	1	0	1	1	0	0	0
60	0	1	0	1	0	1	0	0
61	0	0	1	0	1	1	0	0
62	0	1	0	0	1	0	0	0
63	0	0	1	0	0	1	0	0
64	0	0	0	1	0	1	0	0
						Total:	1,916	100

Note. This table shows the patterns of treatment (i.e., 1=bilingual or dual language instruction) students received from kindergarten to fifth grade for those with complete data on the treatment variables.

Table 4.3

Logistic Regression Analysis of Student-, Family-, and School-level Predictors of Bilingual or Dual Language Instruction at each grade-level: Complete Sample (n=1,100)

	Bilingual or Dual Language Instruction at each grade-level					
	Kindergarten	1st	2nd	3rd	4th	5th
	(1)	(2)	(3)	(4)	(5)	(6)
Fall of Kindergarten *pre*LAS[a]	0.528***	0.552***	0.455***	0.538**	0.429***	0.478***
	(0.092)	(0.098)	(0.084)	(0.105)	(0.096)	(0.103)
Fall of Kindergarten Reading[a]	1.016	1.118	1.151	0.897	1.126	0.839
	(0.139)	(0.152)	(0.168)	(0.146)	(0.196)	(0.160)
Male	0.990	0.788	0.732	1.026	0.938	0.981
	(0.212)	(0.177)	(0.171)	(0.249)	(0.263)	(0.266)
Age at kindergarten-entry (Months)[a]	1.259*	1.129	1.173	1.304*	1.432*	1.767***
	(0.147)	(0.136)	(0.149)	(0.170)	(0.214)	(0.265)
Had Center-based Care Before K	1.265	1.354	0.639+	1.054	1.102	1.208
	(0.282)	(0.316)	(0.154)	(0.264)	(0.323)	(0.338)
Parent Immigrant	2.316*	2.031*	1.907+	2.230*	2.121+	3.615**
	(0.793)	(0.719)	(0.688)	(0.837)	(0.938)	(1.695)
Parent Education						
Less than H.S.	0.918	1.423	1.253	1.067	1.052	0.813
	(0.249)	(0.415)	(0.371)	(0.329)	(0.375)	(0.275)
Some College or Vocational Training	0.982	1.144	0.680	0.920	1.022	0.509
	(0.342)	(0.433)	(0.272)	(0.376)	(0.485)	(0.262)
Bachelor's Degree or Higher	0.733	1.557	0.493	1.183	0.927	0.978
	(0.412)	(0.763)	(0.289)	(0.634)	(0.576)	(0.587)
Income Level[a]	0.628**	0.521***	0.646*	0.712+	0.795	0.812
	(0.108)	(0.100)	(0.117)	(0.133)	(0.169)	(0.169)
Household Size[a]	1.160	1.101	1.021	1.199+	1.222	1.555***

Table 4.3 (continued)

	(0.116)	(0.118)	(0.112)	(0.132)	(0.157)	(0.190)
Spanish Spoken at Home	0.636	0.810	0.318*	0.782	0.458	0.474
	(0.328)	(0.477)	(0.177)	(0.459)	(0.305)	(0.326)
Amount Parents Speak Native Language[a]	0.586+	0.873	1.180	0.619	0.442+	0.766
	(0.183)	(0.283)	(0.396)	(0.225)	(0.201)	(0.302)
Amount Child Speaks Native Language[a]	3.241***	2.474**	1.723+	2.195*	3.186**	1.860+
	(0.907)	(0.713)	(0.508)	(0.704)	(1.299)	(0.634)
Parent English Proficiency[a]	1.301	1.473*	1.322	1.152	1.096	1.007
	(0.230)	(0.268)	(0.253)	(0.226)	(0.249)	(0.222)
Number of Books (log-transformed)[a]	0.721*	0.911	0.961	0.770+	0.832	0.797
	(0.097)	(0.128)	(0.142)	(0.119)	(0.148)	(0.138)
Visited the Library	0.472***	0.642+	0.654+	0.793	0.647	0.797
	(0.106)	(0.150)	(0.158)	(0.201)	(0.191)	(0.225)
Routed through Spanish Assessment at K-entry	0.708	0.648	0.549	0.571	0.550	0.293*
	(0.317)	(0.297)	(0.255)	(0.283)	(0.304)	(0.164)
School-level Variables						
Received Title I Funds	11.464**	15.045**	8.109*	7.772+	4.457	3.995
	(10.633)	(13.588)	(7.649)	(9.348)	(4.603)	(3.816)
% Hispanic[a]	4.473***	3.304***	4.665***	4.429***	4.772***	3.675***
	(0.995)	(0.721)	(1.116)	(1.149)	(1.434)	(1.019)
% EL[a]	0.682**	0.677**	0.493***	0.622**	0.574**	0.611**
	(0.097)	(0.100)	(0.078)	(0.094)	(0.100)	(0.104)
% FRPL[a]	0.706	0.551*	0.710	0.871	0.697	0.826
	(0.209)	(0.150)	(0.221)	(0.310)	(0.275)	(0.303)
Constant	0.007***	0.003***	0.023***	0.004***	0.008***	0.008***
	(0.007)	(0.004)	(0.024)	(0.006)	(0.010)	(0.009)

Note. All covariates were measured during the kindergarten year. [a]Continous variables were standardized prior to running analyses. Coefficients represent odds ratios. Standard errors in parentheses. +p<.10 *p<.05 **p<.01 ***p<.001.

Table 4.4

Regression Analysis of Bilingual or Dual Language Instruction from Kindergarten to 5th grade and 5th Grade Reading Outcomes: FIML Analysis (n≈4,600)

	Spring of 5th grade Reading			
	(1)	(2)	(3)	(4)
Total Years of Bilingual or Dual Language Instruction[a]	0.025+	0.042**		
	(0.014)	(0.014)		
Bilingual or DL Instruction in Kindergarten			0.063	0.123
			(0.091)	(0.090)
Bilingual or DL Instruction in 1st grade			0.162+	0.156+
			(0.094)	(0.094)
Bilingual or DL Instruction in 2nd grade			0.074	0.022
			(0.094)	(0.095)
Bilingual or DL Instruction in 3rd grade			-0.053	0.003
			(0.086)	(0.080)
Bilingual or DL Instruction in 4th grade			-0.171+	-0.172+
			(0.097)	(0.097)
Bilingual or DL Instruction in 5th grade			-0.027	0.002
			(0.090)	(0.086)
Fall of Kindergarten Reading[a]	0.437***	0.400***	0.436***	0.400***
	(0.021)	(0.021)	(0.021)	(0.021)
Fall of Kindergarten *pre*LAS[a]	0.148***	0.191***	0.155***	0.197***
	(0.023)	(0.040)	(0.023)	(0.040)
Student-level Covariates	-	Inc.	-	Inc.
School-level Covariates	-	Inc.	-	Inc.
Constant	0.016	0.247**	0.001	0.232**
	(0.019)	(0.087)	(0.020)	(0.087)

Note. All covariates were measured during the kindergarten year. [a]Continuous variables were standardized prior to running analyses. Student-level covariates include gender, age at kindergarten-entry, whether child had center-based care before kindergarten, parent immigrant status, parent education level, income level, household size, whether Spanish is spoken at home, amount caregiver and child speak Spanish at home, parent self-reported English proficiency, number of books at home, whether the family visited the library, and whether the child was routed through the Spanish assessments at the fall of kindergarten. School-level covariates include whether the school received Title I funds, percent Latino, percent English Learner (EL), and percent free or reduced priced lunch (FRPL). Standard errors were adjusted for school clustering. Standard errors in parentheses. +p<.10 *p<.05 **p<.01 ***p<.001.

Table 4.5.

Regression Analysis of Bilingual and Dual Language Instruction and Spring Reading Outcomes from Kindergarten to Fifth Grade: Student Fixed Effects Analysis

	Reading Scores			
	Model 1	Model 2	Model 3	Model 4
Total Years of Bilingual or Dual Language Instruction at each grade-level	0.036+	0.038+	0.038+	0.049*
	(0.022)	(0.022)	(0.022)	(0.022)
Age at Assessment (Standardized)		0.259***	0.260***	0.230**
		(0.034)	(0.034)	(0.069)
Income (Standardized)		0.035**	0.034**	0.023*
		(0.011)	(0.011)	(0.009)
Wave				
1st grade			-0.001	-0.006
			(0.018)	(0.017)
2nd grade			-0.008	-0.013
			(0.021)	(0.023)
3rd grade			-0.009	-0.021
			(0.024)	(0.025)
4th grade			-0.007	0.004
			(0.024)	(0.035)
5th grade			-0.006	0.006
			(0.025)	(0.030)
Constant	0.028***	0.028***	0.032+	0.060**
	(0.002)	(0.002)	(0.017)	(0.019)
Observations	17272	17272	17272	10474
Groups	4064	4064	4064	2300
Rho	0.79	0.79	0.79	0.79

Note. The reference group for the wave indicator variables is the kindergarten wave of data collection. Standard errors were adjusted for 819 school clusters in Models 1-3. Model 4 includes child weights and standard error adjustments for 18 PSU clusters. Standard errors in parentheses. +p<.10 *p<.05 **p<.01 ***p<.001.

Appendix C
Linear Probability Models

Table 4.1.

Linear Probability Model of Student-, Family-, and School-level Predictors of Bilingual or Dual Language Instruction at each grade-level: FIML Analysis Sample (n≈4,600)

	Bilingual or Dual Language Instruction at each grade-level					
	Kindergarten	1st	2nd	3rd	4th	5th
	(1)	(2)	(3)	(4)	(5)	(6)
Fall of Kindergarten PreLAS[a]	-0.088***	-0.078***	-0.075***	-0.067***	-0.045***	-0.042***
	(0.017)	(0.016)	(0.016)	(0.014)	(0.011)	(0.012)
Fall of Kindergarten Reading[a]	0.012+	0.010	0.017**	0.002	0.007	0.000
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
Male	-0.002	-0.020+	-0.018+	-0.002	0.002	-0.001
	(0.009)	(0.010)	(0.010)	(0.011)	(0.008)	(0.008)
Age at kindergarten-entry (Months)[a]	0.009	0.002	0.007	0.011+	0.010+	0.015**
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Had Center-based Care Before K	0.036*	0.031+	-0.007	0.017	0.005	0.020
	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.014)
Parent Immigrant	0.005	0.009	0.029	0.019	-0.004	0.006
	(0.017)	(0.017)	(0.020)	(0.019)	(0.019)	(0.018)
Parent Education						
Less than H.S.	-0.017	0.010	-0.001	0.007	0.015	0.011
	(0.017)	(0.018)	(0.019)	(0.019)	(0.018)	(0.017)
Some College or Vocational Training	-0.010	-0.005	-0.019+	-0.001	-0.008	-0.010
	(0.011)	(0.012)	(0.011)	(0.013)	(0.012)	(0.011)
Bachelor's Degree or Higher	0.011	0.025	-0.001	0.025	-0.001	-0.006
	(0.013)	(0.016)	(0.015)	(0.016)	(0.013)	(0.013)
Income Level	-0.002	-0.007	-0.007	0.001	0.003	0.008

	(0.007)	(0.008)	(0.007)	(0.008)	(0.007)	(0.006)
Household Size[a]	0.014+	0.006	0.007	0.013	0.009	0.021**
	(0.008)	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)
Spanish Spoken at Home	-0.040*	-0.044*	-0.069***	-0.049**	-0.031+	-0.042*
	(0.017)	(0.018)	(0.019)	(0.018)	(0.018)	(0.019)
Amount Parents Speak Native Language[a]	-0.034*	-0.017	-0.002	-0.021	-0.021	-0.002
	(0.014)	(0.014)	(0.014)	(0.015)	(0.013)	(0.018)
Amount Child Speaks Native Language[a]	0.085***	0.063***	0.053**	0.054***	0.040**	0.028+
	(0.015)	(0.016)	(0.016)	(0.015)	(0.014)	(0.016)
Parent English Proficiency	-0.012	-0.011	0.003	-0.008	-0.017	-0.015
	(0.013)	(0.015)	(0.013)	(0.014)	(0.012)	(0.012)
Number of Books (log-transformed)[a]	-0.015*	-0.007	-0.001	-0.019**	-0.009	-0.011
	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)
Visited the Library	-0.035**	-0.027*	-0.037**	-0.028*	-0.024*	-0.002
	(0.012)	(0.012)	(0.013)	(0.012)	(0.011)	(0.010)
Routed through Spanish Assessment at K-entry	0.124*	0.063	0.079	0.026	0.090*	0.002
	(0.056)	(0.051)	(0.050)	(0.043)	(0.040)	(0.040)
School-level Variables						
Received Title I Funds	0.070**	0.063**	0.057*	0.039	0.039+	0.019
	(0.023)	(0.022)	(0.023)	(0.024)	(0.021)	(0.023)
% Hispanic[a]	0.062***	0.075***	0.071***	0.068***	0.057***	0.050***
	(0.016)	(0.016)	(0.017)	(0.015)	(0.015)	(0.014)
% EL[a]	0.004	-0.031	-0.037*	-0.021	-0.028+	-0.020
	(0.020)	(0.020)	(0.017)	(0.017)	(0.015)	(0.017)
% FRPL[a]	-0.026+	-0.018	-0.017	-0.015	-0.017	-0.011
	(0.016)	(0.016)	(0.016)	(0.016)	(0.013)	(0.015)
Constant	0.100**	0.087**	0.119***	0.087**	0.061+	0.062*
	(0.032)	(0.032)	(0.034)	(0.033)	(0.032)	(0.030)

Note. Standard errors in parentheses. +p<.10 *p<.05 **p<.01 ***p<.001. All covariates were measured during the kindergarten year. Standard errors were adjusted for school clusters.

Appendix D
Post-hoc FIML Analyses: Bilingual Instruction at Kindergarten

Table 4.2.

Regression Analysis of Bilingual or Dual Language Instruction at Kindergarten and K-5th Grade Reading Outcomes: FIML Analysis Sample (n≈4,600)

	Spring Reading Outcomes at each grade level					
	Kindergarten	1st	2nd	3rd	4th	5th
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Bilingual or DL Instruction in Kindergarten	-0.098+	-0.005	0.057	0.101+	0.205***	0.174***
	(0.058)	(0.052)	(0.052)	(0.051)	(0.051)	(0.052)
Fall of Kindergarten Reading (Standardized)	0.720***	0.571***	0.467***	0.419***	0.428***	0.399***
	(0.016)	(0.018)	(0.020)	(0.020)	(0.020)	(0.021)
Fall of Kindergarten PreLAS (Standardized)	0.078**	0.157***	0.197***	0.205***	0.193***	0.197***
	(0.025)	(0.031)	(0.033)	(0.034)	(0.038)	(0.040)
Student-level Vars	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.
School-level Vars	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.
Constant	0.066	0.032	0.172*	0.219**	0.147+	0.230**
	(0.062)	(0.072)	(0.073)	(0.080)	(0.080)	(0.088)

Note. Student-level covariates include gender, age at kindergarten-entry, whether child had center-based care before kindergarten, parent immigrant status, parent education level, income level, household size, whether Spanish is spoken at home, amount caregiver and child speak Spanish at home, parent self-reported English proficiency, number of books at home, whether the family visited the library, and whether the child was routed through the Spanish assessments at the fall of kindergarten. School-level covariates include whether the school received Title I funds, percent Latino, percent English Learner (EL), and percent free or reduced priced lunch (FRPL). All continuous variables were standardized. Standard errors are adjusted for school clusters. Standard error in parentheses. +p<.10 *p<.05 **p<.01 ***p<.001.

Appendix E
Post-hoc FIML Analyses: Bilingual Instruction at First Grade

Table 4.3.

Regression Analysis of Bilingual or Dual Language Instruction at First Grade and 1st-5th Grade Reading Outcomes: FIML Analysis Sample (n≈4,600)

	Spring Reading Outcomes at each grade				
	1st	2nd	3rd	4th	5th
Variables	(1)	(2)	(3)	(4)	(5)
Bilingual or DL Instruction in 1st grade	-0.018	0.079	0.086	0.187***	0.191***
	(0.056)	(0.054)	(0.058)	(0.056)	(0.055)
Fall of Kindergarten Reading (Standardized)	0.572***	0.467***	0.420***	0.429***	0.400***
	(0.018)	(0.020)	(0.020)	(0.020)	(0.021)
Fall of Kindergarten PreLAS (Standardized)	0.154***	0.198***	0.200***	0.185***	0.194***
	(0.031)	(0.033)	(0.035)	(0.038)	(0.040)
Student-level Vars	Inc.	Inc.	Inc.	Inc.	Inc.
School-level Vars	Inc.	Inc.	Inc.	Inc.	Inc.
Constant	0.031	0.170*	0.221**	0.153+	0.232**
	(0.072)	(0.073)	(0.079)	(0.079)	(0.087)

Note. Student-level covariates include gender, age at kindergarten-entry, whether child had center-based care before kindergarten, parent immigrant status, parent education level, income level, household size, whether Spanish is spoken at home, amount caregiver and child speak Spanish at home, parent self-reported English proficiency, number of books at home, whether the family visited the library, and whether the child was routed through the Spanish assessments at the fall of kindergarten. School-level covariates include whether the school received Title I funds, percent Latino, percent English Learner (EL), and percent free or reduced priced lunch (FRPL). All continuous variables were standardized. Standard errors are adjusted for school clusters. Standard error in parentheses. +p<.10 *p<.05 **p<.01 ***p<.001.

Appendix F
Post-hoc FIML Analyses: Bilingual Instruction at Second Grade

Table 4.4.

Regression Analysis of Bilingual or Dual Language Instruction at Second Grade and 2nd-5th Grade Reading Outcomes: FIML Analysis Sample (n=4,600)

	Spring Reading Outcomes at each grade			
	2nd	3rd	4th	5th
Variables	(1)	(2)	(3)	(4)
Bilingual or DL Instruction in 2nd grade	-0.034	-0.019	0.091+	0.104+
	(0.048)	(0.054)	(0.054)	(0.060)
Fall of Kindergarten Reading (Standardized)	0.469***	0.421***	0.429***	0.400***
	(0.020)	(0.020)	(0.020)	(0.021)
Fall of Kindergarten PreLAS (Standardized)	0.189***	0.192***	0.178***	0.186***
	(0.033)	(0.034)	(0.038)	(0.039)
Student-level Vars	Inc.	Inc.	Inc.	Inc.
School-level Vars	Inc.	Inc.	Inc.	Inc.
Constant	0.180*	0.230**	0.157+	0.234**
	(0.073)	(0.079)	(0.080)	(0.088)

Note. Student-level covariates include gender, age at kindergarten-entry, whether child had center-based care before kindergarten, parent immigrant status, parent education level, income level, household size, whether Spanish is spoken at home, amount caregiver and child speak Spanish at home, parent self-reported English proficiency, number of books at home, whether the family visited the library, and whether the child was routed through the Spanish assessments at the fall of kindergarten. School-level covariates include whether the school received Title I funds, percent Latino, percent English Learner (EL), and percent free or reduced priced lunch (FRPL). All continuous variables were standardized. Standard errors are adjusted for school clusters. Standard error in parentheses. +p<.10 *p<.05 **p<.01 ***p<.001.

CHAPTER 5

Summary and Conclusions

As the percentage of Latino students in public school classrooms and in higher education institutions across the U.S. increases, it is imperative to continue examining the evidence-based instructional approaches that contribute positively to their academic achievement. Additionally, as many districts in the nation are under increasing pressure to meet federally- and state-mandated academic standards and disaggregate school-level test scores by subgroups of students (i.e., Latinos, FRPL, EL, and special education status), instructional solutions are often sought to ensure they continue to meet such standards and remain eligible for federal and state funding. This dissertation partially addresses these concerns by offering some evidence-based solutions for raising the reading performance of Latino and Spanish speaking students.

In Study One, I investigated the impact and effectiveness of Spanish-English biliterate paraprofessionals (BIAs) in improving the reading performance of first graders within the lowest performing schools in a predominantly Latino and low-income school district in Southern California. The BIA program was district-led, and district administrators, as well as school leaders, were responsible for hiring, training, and funding these paraprofessionals. Thus, this study was a large-scale implementation study of paraprofessionals and offers some insight into implementation features that appear most promising for promoting students' reading skills.

Utilizing a quasi-experimental analytic design, results from the comparative interrupted time series analysis comparing the school-level trends of schools that received BIAs (n=6) and matched comparison schools (n=5) revealed that BIAs had a large, positive impact on average school performance across the 6 BIA schools (ES=.825, $p<.10$), though this was a marginally significant finding. Nevertheless, considering this was a pilot study, as well as the small number

of school clusters, this p-value was deemed acceptable, and the large coefficient estimate lends further support for the positive impact of BIAs on school-level performance. Moreover, results from the individual-level regression analysis predicting students' reading outcomes during the implementation year (n=865), while also controlling for prior performance and student demographics, revealed that BIAs had a significantly, positive impact on reading performance among those students within schools that received BIAs (ES=.193, $p<.05$).

In addition to these results, the classroom-level analysis assessing the relationship between the amount of time BIAs spent in classrooms and the primary type of instructional grouping they provided (i.e., individualized/2-1, small group, or large group) revealed that every additional hour BIAs spent in classrooms (n=28) resulted in significantly, positive effects on average classroom reading performance (ES=.459, $p<.001$) among those classrooms that received BIAs, which is a sizable effect. Additionally, classrooms that primarily provided BIA supplemental instruction 1-1 or 2-1 had average reading scores that were .634 SD greater than those providing large group instruction (5 or more students), and this was also a significant finding ($p<.05$) and sizable effect. Another notable finding from this analysis was that as these instructional variables were included in the regression model, the negative coefficient for EL status on classroom reading performance reduced in magnitude and was no longer significant. Overall, these combined results lend further support to the notion that biliterate paraprofessionals had a positive impact on the reading performance of Latino and EL students.

Further exploring some of the implementation features among the two groups of BIA classrooms that made the most and least gains in reading performance as determined from the prediction curve from the classroom-level regression analysis revealed some notable patterns that provide further insight into those implementation features that may be important for replicating

study findings in other contexts. These implementation features included instructional content and delivery, monitoring student progress, classroom behavior management, communication and collaboration with teachers, and ongoing professional development, training, and support for instructional assistants.

As discussed in Chapter 3, the breadth and depth of the instructional activities BIAs facilitated was a noteworthy feature distinguishing the high and low gain classrooms. The BIAs in those classrooms that made the highest gains were observed providing supplemental instruction in various reading components, including phonological and phonemic awareness, reading fluency, reading comprehension, and writing and dictation, whereas those in low gain classrooms had less variety in the reading components covered during instruction. This follows the recommendation offered by the IES Practice Guide (Gersten et al., 2008), which states that supplemental instruction should cover at least up to three of the five reading components.

High gain classrooms were also observed regularly monitoring student progress and had greater opportunities to discuss student progress with teachers. They also provided more individualized or small group support reducing the amount and frequency of student disruptions or disengagement. These implementation features highlight the importance of the amount of time BIAs assist teachers and the type of instructional grouping they provide to students, both of which were significant predictors of classroom reading performance as discussed above. Lastly, the district provided ongoing professional development to BIAs, including more personalized feedback by hiring an instructional coach that assisted them weekly for at least a month, and many BIAs, particularly those in high gain classrooms, also had opportunities to ask teachers questions and receive feedback on their instruction. Overall, the implementation features

discussed above offer some insight into the essential elements of a paraprofessional program that may be necessary for reproducing study findings.

In addition to providing Latino students with supplemental instruction in reading, another instructional approach for raising their reading performance is providing them native language instruction. Study two in this dissertation reviews and examines the relationship between bilingual or dual language (DL) instruction in elementary school and students' reading outcomes at fifth grade. First, I reviewed the patterns of treatment (i.e., bilingual or DL instruction) Latino students in the U.S. received, which provides some insight into the prevalence of these programs among a nationally representative sample of students and is the first account of such findings.

As described in Chapter 4, only 20% of Latino students in the sample received any bilingual instruction during grades K-5 with only about 4% receiving this instruction every year. Another 7% of children who received this instruction began receiving it in kindergarten and eventually transitioned out of bilingual instruction. For instance, about 1-2% of the total sample of students exited out of these programs at each year after kindergarten. The remainder of students who received this instruction (about 9% of the total sample) experienced different configurations of treatment, though these patterns were less common. These findings provide some descriptive information about bilingual and DL instruction Latino students receive nationwide.

Next, I examined the student and school variables that were most predictive of students participation in bilingual programs from kindergarten to fifth grade. Factors that were consistently predictive of bilingual instruction were related to students' language status. Specifically, those students that had higher English oral language proficiency skills as measured by the prelas were less likely to receive native language instruction from grades K-5. Likewise,

those children whose parents reported speaking more Spanish to their caregivers at home and those with parents who were immigrants were more likely to receive native language instruction.

After further investigating the school-level predictors of bilingual instruction at each year, we also found that nearly all students who received this instruction attended Title I schools. This is an important finding that highlights the importance of federal funding in providing schools with large percentages of Latino and Spanish speaking students, as well as those from low-income backgrounds, with the resources needed to implement these native language programs.

Finally, findings from the regression analysis predicting students' fifth grade reading outcomes revealed that with each additional year of native language instruction, students scored .05 SD greater than their peers ($p<.01$), even while controlling for a range of student and school characteristics, as well as their beginning reading and English prelas scores. Additionally, the largest coefficient estimate in the regression model that included six dummy variables for whether a student received bilingual instruction at each year from K-5 was at 1st grade ($b=0.171$, $p<.10$), and this was a marginally significant finding, suggesting that bilingual or DL instruction is likely most beneficial in first grade. These findings are significant as they reveal the potential benefits of providing Latino students, particularly those from low-income backgrounds and those who primarily speak Spanish at home, with native language instruction. This aligns well with current theories and research regarding bilingual and dual language programs that show the significant benefits of these native language programs on students' longitudinal reading outcomes (Cheung & Slavin, 2012; Steele et. al., 2017; Umansky & Reardon, 2014).

Future Research

Although findings from this dissertation outline the benefits of these two instructional approaches in terms of the reading achievement of Latino students, more research regarding the effectiveness of these approaches on other developmental outcomes (e.g., social emotional skills, and science and mathematics achievement) is necessary. For instance, Simpkins et al., (2020) found that children's noncognitive skills, such as work habits or approaches to learning, measured at first grade and growth in these skills from first to sixth grade predicted academic outcomes at the beginning and end of high school, and indirectly predicted their educational attainment at 26 years of age. Additionally, Burchinal et al., (2020) found that children's executive function, social-emotional skills, and parent-reported internalizing behaviors measured prior to school-entry predicted both the level and rates of change in academic skills from kindergarten through third grade. Furthermore, Latinos are drastically underrepresented in science, technology, engineering, and mathematics (STEM) fields in terms of degree attainment and participation in STEM-related professions (Taningco, Mathew, & Pachon, 2008). Thus, understanding the impact of the two instructional approaches presented above on student's social emotional and other noncognitive skills, such as working memory and executive function, as well as their impact on STEM-related skills, would add further insight into other potential benefits (or drawbacks) of these programs on students' academic achievement and development overall.

Another area for future research is to examine the implications of these instructional programs on family engagement and participation. It is likely that hiring more bilingual paraprofessionals and educators would benefit Spanish speaking families by increasing opportunities for communication between teachers and parents about student progress and would

enable parents to learn more about how to engage with their child in learning activities at home in their native language making them partners in their child's learning.

Conclusion

Overall, the two studies presented in this dissertation expand the evidence base by examining the impact of two instructional approaches on Latino student's reading achievement. Study One investigating the impact and large-scale implementation of a biliterate paraprofessional program fills a major gap as there is little research on the effectiveness of paraprofessionals in reducing disparities in academic achievement particularly between EL students and their native English-speaking peers. Study Two examining the relationship between bilingual and dual language instruction on Latino students' outcomes at the end of fifth grade provide further evidence supporting expansion of these programs. Findings from both studies contribute to our understanding of how schools can better equip students with the literacy skills needed for academic excellence and offer strategies for further reducing educational inequities.

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