

# Regional Educational Laboratory (REL) 2012–2017

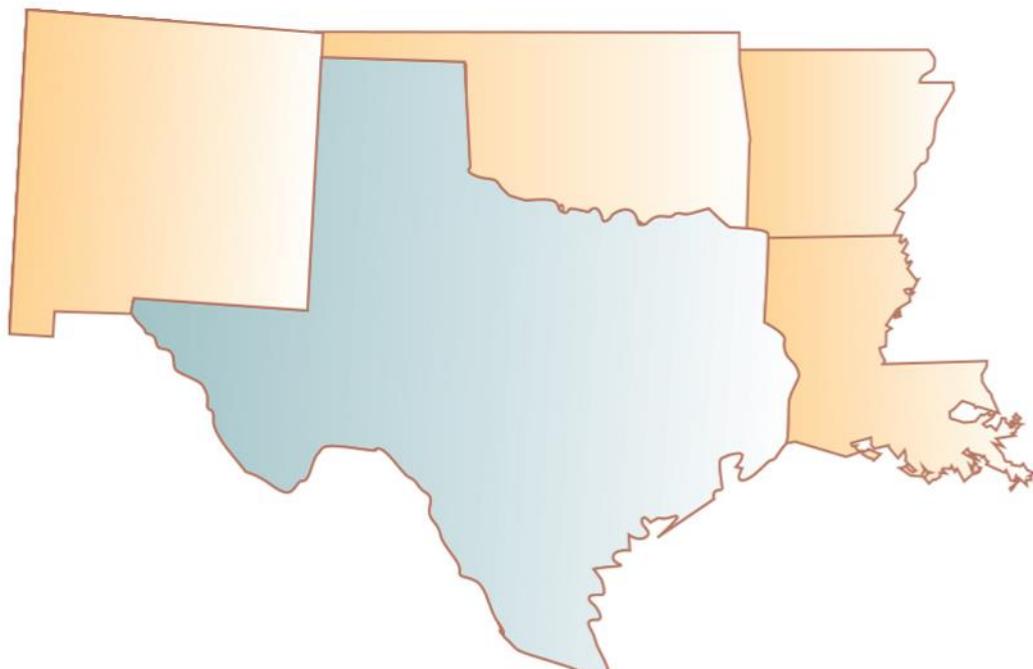
ED-IES-12-C-0012

Southwest Region

## What Did We Learn?

Teacher certification and academic growth for  
English learner students in  
Houston Independent School District

Verónica Ruiz de Castilla  
*American Institutes for Research*



SOUTHWEST Regional Educational Laboratory Southwest

# Limited distribution report

This document, developed under Contract ED-IES-12-C-0012 by the Regional Educational Laboratory (REL) Southwest, contains preliminary information related to a research study being conducted by REL Southwest and is intended for use by a limited audience. The proposed work described in this document has been supported by the Institute of Education Sciences (IES) of the U.S. Department of Education. This work is in a preliminary stage, and the material in this document has not yet been approved by IES for public distribution. **Authorized users of this document are limited to the English Learners Research Alliance. You may not distribute this document to unauthorized users.**

The material in this document has been prepared to provide information and encourage discussion that may guide research, policy, and practice. The information herein should not be used in isolation to reach definitive conclusions. REL Southwest staff members are available to facilitate discussion, to provide further relevant information, and in some cases, to partner on research to build an increasingly solid body of knowledge.

## Purpose of this report

REL Southwest will provide several limited distribution reports throughout the course of this project. These short reports, which are intended for the sole use of the REL Southwest English Learners Research Alliance, will provide information such as key updates and summaries of study methods, data analyses, and findings.

This **What Did We Learn?** limited distribution report provides a summary of the key preliminary findings.

This limited distribution report is the fourth in a five-part series that will be provided for this project.

- What Do We Want to Learn?
- What Do We Know?
- How Will We Learn More?
- **What Did We Learn?**
- What Else Do We Want to Learn?

## Regional Educational Laboratory Southwest

4700 Mueller Blvd., Austin, TX 78723

Tel: 512-476-6861 or 800-476-6861

E-mail: [relsouthwest@air.org](mailto:relsouthwest@air.org) | Fax: 512-476-2286

Website: <http://relsouthwest.sedl.org>

Follow us on Twitter @relsouthwest



## Acknowledgments

The REL Southwest study team is grateful to Dr. Altagracia “Gracie” Guerrero, Assistant Superintendent for Multilingual Programs at the Houston Independent School District, for her support to make this study possible.

The study assesses whether a teacher's certification type—being a certified bilingual teacher or a certified ESL teacher—and route to certification—alternative, postbaccalaureate, traditional, or additional exam<sup>1</sup>—correlate with academic growth and growth in English proficiency among English learner students whose home language is Spanish.

## Background

From 2004/05 to 2014/15, the number of English learner students in bilingual or English as a second language (ESL) programs in Texas increased by 47 percent. In the Houston Independent School District (ISD)—the largest district in Texas and the seventh largest in the United States—30 percent of students are English learner students, and 92 percent of these students have Spanish as their home language. The number of students served by the district in bilingual or ESL programs grew at more than twice the rate of total enrollment during the course of the 2014/15 academic year. The number of first-year immigrants has more than doubled since 2011/12, and these newcomers lag behind other English learner students in terms of their English proficiency (Houston ISD, 2016). As a result of these factors, the district has been facing a critical shortage of bilingual-certified teachers.

Aware of these challenges, the members of Regional Educational Laboratory (REL) Southwest's English Learners Research Alliance sought to obtain clear and actionable information that districts can use when recruiting teachers and assigning them to schools and classrooms that serve large numbers of English learner students. To respond to the needs of the Alliance, REL Southwest designed this study, which uses data obtained from the Texas Education Agency (TEA) and Houston ISD. The study examines the relationship between teacher certification and growth in academic achievement and English proficiency with 10 cohorts of grade 4 and 9 cohorts of grade 5 Houston ISD English learner students between 2005/06 and 2014/15.

## Research questions

To describe the association between teacher certification characteristics and Spanish-speaking English learner student achievement growth, the study addresses two research questions.

For Houston ISD English learner students whose home language is Spanish in grades 4 and 5,

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<sup>1</sup> Additional exam route is also known as “additional certification by exam.” A teacher who holds a valid Texas classroom teaching certificate and a bachelor’s degree may add classroom certification areas by completing the appropriate examination. Alternative route is a nontraditional route to certification that may allow one to teach while completing the requirements and is offered by universities, school districts, education service centers, community colleges, and private entities. Postbaccalaureate route is offered by university programs to a person with a bachelor’s degree or higher. Traditional route is when a person obtains a bachelor’s of education degree from an accredited university. For a detailed description of each route to certification in Texas, visit [http://tea.texas.gov/Texas\\_Educators/Certification/Initial\\_Certification/](http://tea.texas.gov/Texas_Educators/Certification/Initial_Certification/).

1. What are the value-added contributions to English learner students' growth in math, reading, and English proficiency of bilingual- and ESL-certified teachers?
2. What are the value-added contributions to English learner students' growth in math, reading, and English proficiency of bilingual- and ESL-certified teachers trained through different routes to certification?

The study examined years 2011/12–2014/15 using the State of Texas Assessments of Academic Readiness (STAAR) assessment program for math/reading and years 2005/06–2014/15 using the Texas English Language Proficiency Assessment System (TELPAS) assessment for English proficiency. REL Southwest also analyzed math/reading results for years 2005/06–2010/11 using the Texas Assessment of Knowledge and Skills (TAKS) assessment program; these are presented in the full report (Ruiz de Castilla, forthcoming).

## Data

The data used for this study were obtained from TEA and Houston ISD and accessed through the University of Texas Education Research Center (Texas ERC). Researchers used student–teacher-matched rosters provided by Houston ISD and student and teacher data provided by TEA. REL Southwest obtained access to student test scores, student demographics (i.e., race, ethnicity, age, gender, English learner student status, and poverty status [whether the student was eligible for the federal free or reduced-price lunch program]) teacher certification and demographic information, and school characteristics.

### Analytic samples

The samples for addressing the research questions consisted of 10 grade 4 cohorts and 9 grade 5 cohorts of English learner students and their teachers in 156 elementary schools in Houston ISD. The student sample consisted of Houston ISD English learner students in grade 4 or 5 during the 2005/06–2014/15 school years who participated in Houston ISD's bilingual or ESL program in grade 4 or 5 and for whom Spanish was designated as their home language. The first six grade 4 cohorts (2005/06–2010/11) and five (2006/07–2010/11) grade 5 cohorts made up the analytic sample for the math and reading outcomes using the TAKS assessment program; the remaining four cohorts (2011/12–2014/15) made up the analytic sample for the same outcomes using the State of Texas Assessments of Academic Readiness (STAAR) assessment program. All 10 grade 4 cohorts and 9 grade 5 cohorts made up the analytic sample for the English proficiency outcomes using the Texas English Language Proficiency Assessment System (TELPAS) assessment. The average grade 4 cohort in the analytic sample contained about 3,800 English learner students in 2006/07–2010/11 and about 4,800 students in 2011/12–2014/15. The average grade 5 cohort contained about 2,700 English learner students in 2006/07–2010/11 and about 3,700 students in 2011/12–2014/15. More details on the student samples by assessment program are given in tables 1 and 2 in the appendix.

The corresponding teacher sample consisted of Houston ISD teachers who taught mathematics or reading to the student sample described in the previous paragraph. The score used to measure growth in English proficiency was the reading scale score from the TELPAS assessment; thus, reading teachers were also used in the analysis on English proficiency. To be included in the sample for a

particular subject in grade 4 or grade 5, a teacher must have had at least 10 Spanish-speaking English learner students across the years of data used for the analyses to ensure that the estimates were based on a sufficient number of observations. The final study samples included between 302 and 809 teachers and between 9,850 and 38,716 students, depending on grade and assessment program. Teachers did not need to be fully certified to be included in the sample (see table 3 in the appendix).

## Methods overview

In this study, grade 3 test scores served as a pretest for the grade 4 cohorts, and grade 4 test scores as a pretest for the grade 5 cohorts. All test scores were standardized to have a mean of zero and a standard deviation of one within each grade-year combination. Therefore, all figures illustrating assessment scores in the report are in standard deviation units. Student achievement models were then constructed to estimate the association between teacher certification characteristics and English learner students' growth in math, reading, and English proficiency.

The data analysis for this study was conducted as follows:

1. Student achievement models, sometimes referred to as value-added specifications, were formulated to predict student achievement growth and included teacher certification characteristics as predictors. These models calculated coefficients on certification type and route variables; included student, teacher, and school demographic covariates; and were estimated by grade (4, 5), subject (math, reading, English proficiency), and state assessment program (TAKS, STAAR, TELPAS).
2. The study team then examined (by grade, subject, and state assessment program) whether specific teacher certification types (research question 1) and routes (research question 2) were associated with larger achievement gains. To obtain an accurate estimate of the contribution of a teacher's certification route on English learner students' growth, the analyses needed to account for both certification route and certification type. The total certification (certification type and certification route) contributions to English learner students' growth are reported in figures 2–6. Bilingual through alternative route and ESL through additional exam indicators were not included in the model and thereby served as the reference categories, the coefficients on the other type by route indicators measured the effects of the other routes relative to the reference route.

## Key findings

### Research question 1: Contributions of bilingual- and ESL-certified teachers to English learner students

Having a certified bilingual teacher was associated with greater growth in math and reading for English learner students in grade 4 and lower growth in math for English learner students in grade 5 compared to having a teacher not certified in bilingual or ESL.

In grade 4, certified bilingual teachers were associated with greater growth in math and reading than teachers with no bilingual or ESL certification (see table 1 and figure 1). The effect size is 0.12, and is equivalent to 21 percent of the average annual gain in math from grade 4 to grade 5 in nationally normed tests (Hill, Bloom, Black, & Lipsey, 2008). An additional reference to put this effect size in context is the size of the math achievement gap between grade 4 English learner and non-English learner students in the 2015 National Assessment of Educational Progress (NAEP) Trial Urban District Assessment (TUDA) for Houston ISD: 12.3 standard deviations (U.S. Department of Education, 2015). The effect size in reading is 0.04. To put this 0.04 effect size in context, the size of the reading achievement gap between grade 4 English learner and non-English learner students in HISD in the 2015 NAEP assessment was 15 standard deviations, so the effect size of a bilingual teacher in grade 4 is less than 1 percent of the gap in reading between English learner and non-English learner students in the district.

**Table 1. Certified bilingual teachers were associated with English learner students' growth in math and reading in grade 4**

	Bilingual certification			ESL certification	
	Effect		Direction	Effect	
	Direction	Effect size		Direction	Effect size
Grade 4	Math	+	0.12***	na	-0.01
	Reading	+	0.04*	na	-0.03
	English proficiency	na	-0.01	na	0.00
Grade 5	Math	-	-0.08**	na	0.02
	Reading	na	-0.02	na	0.01
	English proficiency	na	0.01	na	0.00

ESL is English as a second language.

+ and – stand for significant positive and negative effect, respectively.

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

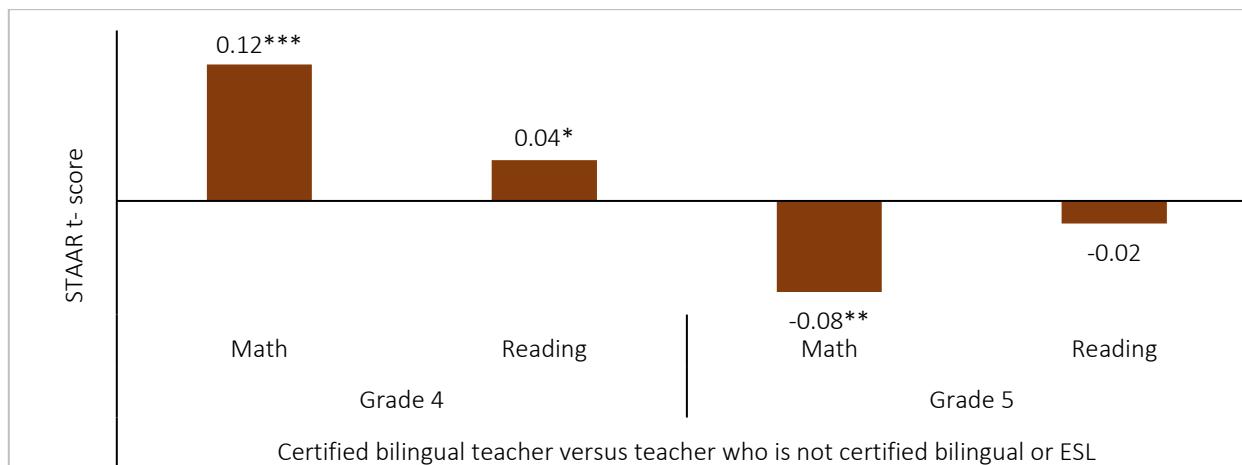
na stands for not applicable since the parameter is not significant.

Note: The reference group is teachers who are not certified as either bilingual or ESL teachers.

Source: Authors' analyses of data provided by the Houston Independent School District and the Texas Educational Research Center at the University of Texas at Austin and described in appendix B.

In grade 5, certified bilingual teachers were associated with lower math growth compared to teachers who were not certified bilingual or ESL, with an effect size of  $-0.08$  (figure 1). In the case of reading, there is no evidence that certified bilingual teachers contributed more or less to grade 5 English learner students' growth compared to teachers who were not certified bilingual or ESL.

**Figure 1. Certified bilingual teachers were associated with English learner students' growth in math and reading in grade 4 on the State of Texas Assessments of Academic Readiness**



ESL is English as a second language. STAAR is State of Texas Assessments of Academic Readiness.

\*Significant at  $p < .05$ . \*\* Significant at  $p < .01$ . \*\*\* Significant at  $p < .001$ .

Source: Authors' analyses of data provided by the Houston ISD and the Texas Educational Research Center at the University of Texas at Austin.

There was no evidence that having a certified bilingual teacher contributed more or less to grade 4 or 5 English learner students' growth in English proficiency. The estimates suggest that being assigned a certified bilingual reading teacher did not contribute significantly more or less to English learner students' English proficiency compared to teachers who are not certified bilingual or ESL in either grade 4 or grade 5.

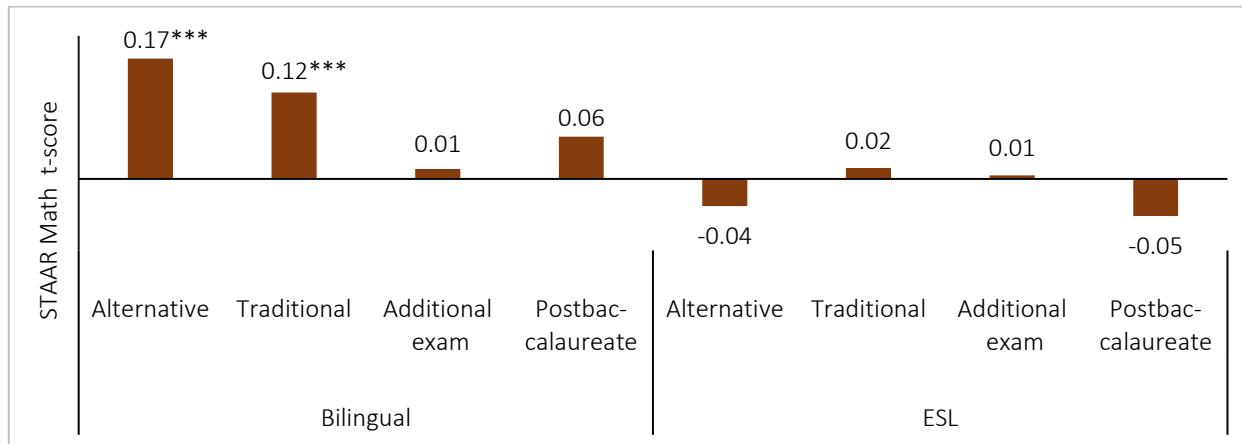
There was no evidence that having a certified English as a second language teacher contributed more or less to grade 4 or 5 English learner students' growth in math, reading, or English proficiency. Being assigned a certified ESL teacher did not contribute significantly more or less to grade 4 or grade 5 English learner students' math or reading achievement growth compared to being assigned a teacher who was not certified bilingual or ESL (the reference group). Likewise, ESL-certified teachers did not contribute significantly more or less to English learner students' English proficiency compared to teachers who were not certified bilingual or ESL in either grades 4 or 5.

## Research question 2: Contributions of bilingual- and ESL-certified teachers certified through different routes

Bilingual teachers certified through alternative routes were associated with greatest growth in grade 4 math compared with teachers certified through other routes.

In grade 4, estimates suggest that bilingual teachers certified through alternative routes were associated with the most growth in math achievement compared to bilingual and ESL teachers certified through other routes and compared to teachers with no bilingual or ESL certification. Specifically, only two of the four routes to bilingual certification were associated with significant effects on math achievement growth: alternative routes (effect size = 0.17) and traditional routes (effect size = 0.12) (see figure 2 and table 2). Relating the magnitude of these effect sizes to the NAEP grade 4 math achievement gap between English learner and non–English learner students mentioned previously, the contribution of bilingual teachers certified through alternative routes to English learner students' math growth is equivalent to 1.4 percent of that achievement gap. The contribution of bilingual teachers from traditional routes is 1 percent of that gap. Students assigned to bilingual teachers from the additional exam and postbaccalaureate routes did not experience significantly different growth in math compared to students assigned to teachers with no bilingual or ESL certification.

**Figure 2. Bilingual teachers from alternative certification routes were associated with English learner students' greatest math achievement growth in grade 4**



ESL is English as a second language. STAAR is State of Texas Assessments of Academic Readiness.

\* Significant at  $p < .05$ . \*\* Significant at  $p < .01$ . \*\*\* Significant at  $p < .001$ .

Source: Authors' analyses of data provided by the Houston ISD and the Texas Educational Research Center at the University of Texas at Austin.

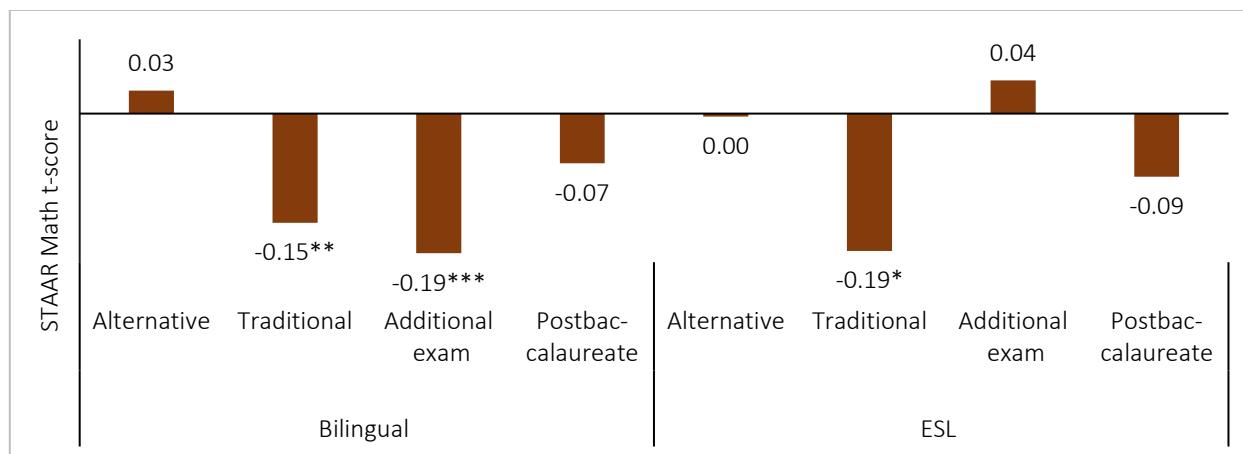
Bilingual teachers from the additional exam route and ESL teachers from traditional routes were associated with the least math achievement growth in grade 5 compared with teachers certified through other routes.

In grade 5, estimates suggest that bilingual teachers certified through the additional exam route and ESL teachers certified through traditional routes were associated with the least growth in math achievement compared to bilingual and ESL teachers certified through other routes and compared to teachers with no bilingual or ESL certification (see figure 3). Specifically, only two of the four routes to bilingual certification and only one of the four routes to ESL certification were associated with significant effects on math achievement growth, and in all three cases, the effect was negative: bilingual traditional (effect size =  $-0.15$ ), bilingual additional exam (effect size =  $-0.19$ ), and ESL traditional (effect size =  $-0.19$ ) routes. Students assigned to bilingual teachers from alternative or postbaccalaureate routes did not experience significantly different growth in math compared to students assigned to teachers with no bilingual or ESL certification. Similarly, students assigned to ESL teachers from alternative, additional exam, or postbaccalaureate routes did not experience significantly different growth in math compared to students assigned to teachers with no bilingual or ESL certification. The analysis was not able to detect an association between bilingual or ESL teachers certified through other routes and math achievement growth in grade 5.

To determine the difference in achievement growth between students assigned to bilingual teachers from traditional routes and those assigned to bilingual teachers from the additional exam route, the effect size from the additional exam route teachers is subtracted from the effect size from traditional route teachers:  $-0.15 - -0.19 = +0.04$ . This difference in effect size would translate to the mean math score of students taught by bilingual teachers from traditional routes being at the 52nd percentile of students taught by a bilingual teacher from the additional exam route.

As mentioned previously, having an ESL teacher certified through traditional routes also was associated with the least math achievement growth in grade 5 compared to ESL teachers certified through other routes and compared to teachers with no ESL or bilingual certification. The estimated effect size was  $-0.19$  (figure 3 and table 2), which translates to an improvement index of  $-8$ . To put this effect size in terms of percentiles, it indicates that the mean math score of the students taught by ESL teachers from traditional routes would be at the 42nd percentile of the students taught by an ESL teacher certified through other routes or by a teacher with no ESL or bilingual certification. The analysis was not able to detect an association between ESL teachers certified through alternative, additional exam, and postbaccalaureate routes and math achievement growth in grade 5.

**Figure 3. Bilingual teachers from the additional exam certification route and ESL teachers from traditional certification routes were associated with English learner students' least math achievement growth in grade 5**



ESL is English as a second language. STAAR is State of Texas Assessments of Academic Readiness.

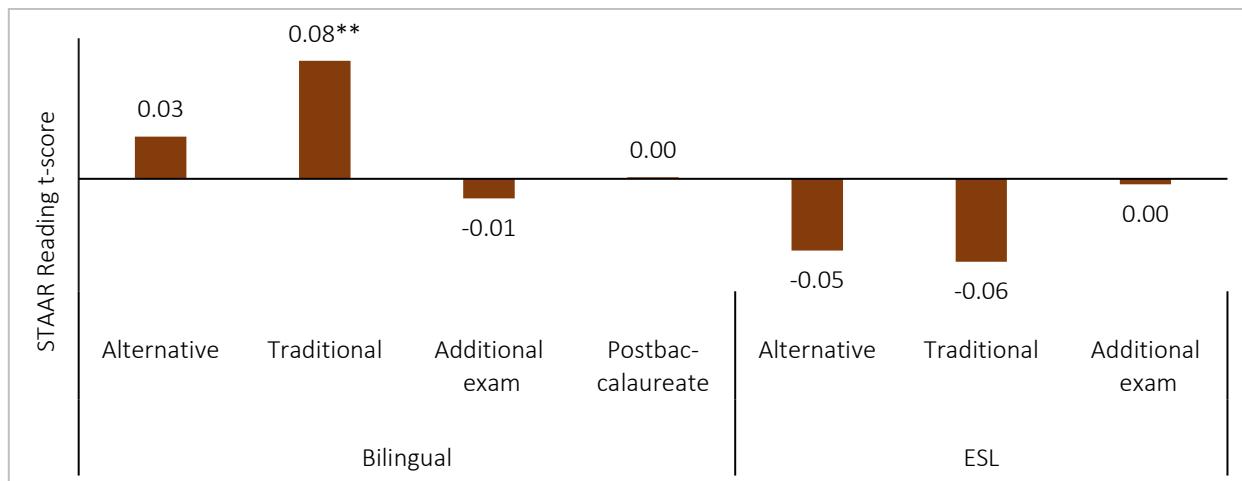
\* Significant at  $p < .05$ . \*\* Significant at  $p < .01$ . \*\*\* Significant at  $p < .001$ .

Source: Authors' analyses of data provided by the Houston ISD and the Texas Educational Research Center at the University of Texas at Austin.

**Bilingual teachers from traditional routes were associated with greatest growth in grade 4 reading compared with teachers certified through other routes.**

In grade 4, the analyses suggest that bilingual teachers certified through traditional routes were associated with the most growth in reading compared to bilingual and ESL teachers certified through other routes and compared to teachers with no bilingual or ESL certification. Specifically, only one of the four routes to bilingual certification was associated with significant effects on reading achievement growth: traditional routes (see figure 4 and table 2). The effect size of bilingual teachers from traditional routes on reading growth is 0.08, which results in an improvement index of +3 and indicates that the mean reading score of the students taught by a bilingual teacher from traditional routes would be at the 53rd percentile of students taught by a bilingual teacher from any other route or by an ESL teacher from any route (figure 4). Results also indicated that bilingual teachers from alternative, additional exam, or postbaccalaureate routes and ESL teachers from any route were not associated with greater or lesser reading achievement growth compared with teachers with no bilingual or ESL certification.

**Figure 4. Bilingual teachers from traditional certification routes were associated with English learner students' greatest reading achievement growth in grade 4**



ESL is English as a second language. STAAR is State of Texas Assessments of Academic Readiness

\* Significant at  $p < .05$ . \*\* Significant at  $p < .01$ . \*\*\* Significant at  $p < .001$ .

Source: Authors' analyses of data provided by the Houston ISD and the Texas Educational Research Center at the University of Texas at Austin.

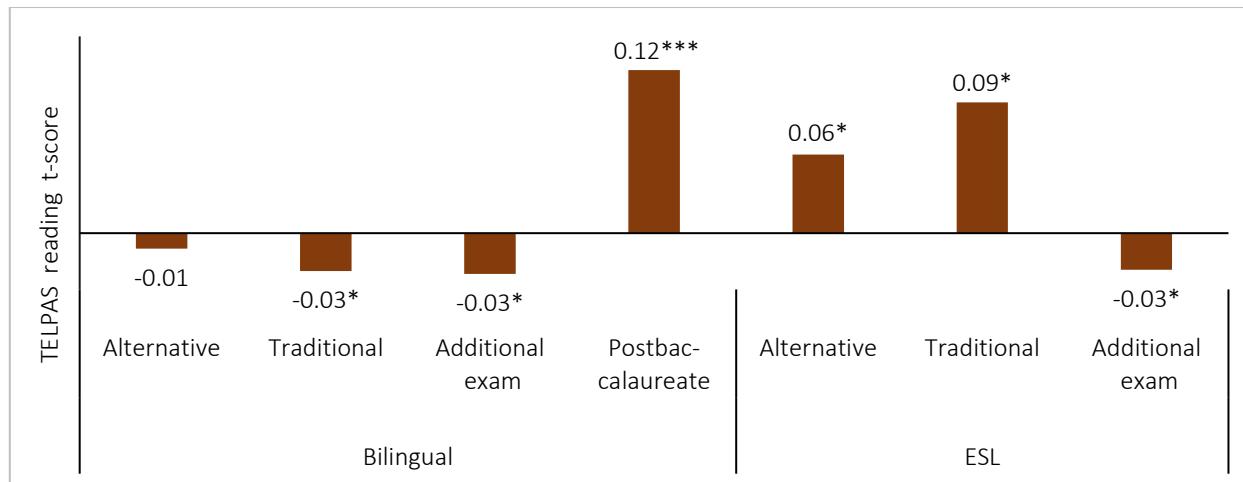
**Teacher certification route was not associated with teachers' contributions to English learner students' grade 5 reading achievement.** The results suggest that the different certification routes chosen by bilingual and ESL teachers could not explain any difference in their contributions to English learner student achievement in reading.

Bilingual teachers from postbaccalaureate routes were associated with greatest growth in grade 4 English proficiency compared with teachers certified through other routes. The analyses on English proficiency outcomes in grade 4 suggest that bilingual teachers certified through postbaccalaureate routes were associated with the most growth in English proficiency compared to bilingual and ESL teachers from other routes and compared to teachers with no bilingual or ESL certification (see figure 5). Specifically, only one of the four routes to bilingual certification was associated with a positive and significant effect on English proficiency growth: postbaccalaureate. Two routes to bilingual certification were associated with negative and significant effects: traditional and additional exam (figure 5 and table 2). Students assigned to bilingual teachers from alternative routes did not experience significantly different growth in English proficiency compared to students assigned to teachers with no bilingual or ESL certification. Although ESL teachers from alternative and traditional routes also were associated with positive growth in English proficiency, their effect size was smaller than that of bilingual teachers from postbaccalaureate routes. This finding is discussed further later in the report. **The estimated effect size of bilingual teachers from postbaccalaureate routes was +0.12 (figure 5 and table 2)..**

To determine the difference in achievement growth between students assigned to bilingual teachers from postbaccalaureate routes and those assigned to bilingual teachers certified through traditional routes ( $-0.03$ ), the effect size from traditional route teachers ( $-0.03$ ) is subtracted from

the effect size from postbaccalaureate route teachers:  $0.12 - -0.03 = 0.15$ . The effect size from the additional exam route is also  $-0.03$  (figure 5 and table 2).

**Figure 5. Bilingual teachers from postbaccalaureate certification routes were associated with English learner students' greatest English proficiency growth in grade 4**



ESL is English as a second language. TELPAS is Texas English Language Proficiency Assessment System.

\* Significant at  $p < .05$ . \*\* Significant at  $p < .01$ . \*\*\* Significant at  $p < .001$ .

Note: Data are missing for the postbaccalaureate route for English as a second language (ESL) teachers in the figure due to the small sample size for the specific route.

Source: Authors' analyses of data provided by the Houston Independent School District and the Texas Educational Research Center at the University of Texas at Austin.

English as a second language teachers from traditional routes were associated with greater growth in English proficiency in grade 4 compared with English as a second language teachers certified through other routes. The analyses on English proficiency outcomes in grade 4 suggest that ESL teachers certified through traditional routes were associated with greater growth in English proficiency compared to ESL teachers from other routes and compared to teachers with no bilingual certification (figure 5 and table 2). Furthermore, ESL teachers from traditional routes also were associated with greater growth in English proficiency compared to bilingual teachers from alternative, traditional, and additional exam routes (figure 5). Specifically, two of the three routes to ESL certification for which data were available were associated with positive and significant effects on English proficiency growth: traditional (effect size = 0.09) and alternative (effect size = 0.06) routes. One route to ESL certification was associated with a negative and significant effect: additional exam route. The effect size of ESL teachers from traditional routes is 0.09. The effect size of ESL teachers from alternative routes is 0.06, (figure 5 and table 2).

**Table 2. The association between bilingual and ESL teachers by certification route and student achievement growth varies by grade and subject**

		Bilingual certification				ESL certification			
		Direction and size of effects				Direction and size of effects			
Grade	Grade and outcome	Alternative	Traditional	Additional exam	Postbacca-laureate	Alternative	Traditional	Additional exam	Postbacca-laureate
Grade 4	Math	0.17***	0.12***	0.01	0.06	-0.04	0.02	0.01	-0.05
	Reading	0.03	0.08**	-0.01	0.00	-0.05	-0.06	-0.00	a
	English proficiency	-0.01	-0.03*	-0.03*	0.12***	0.06*	0.09*	-0.03*	a
Grade 5	Math	0.03	-0.15**	-0.19***	-0.07	-0.00	-0.19*	0.05	-0.09
	Reading	-0.02	-0.03	-0.01	-0.15	-0.01	-0.11	0.01	a
	English proficiency	0.04*	-0.02	-0.02	0.10	0.00	0.05	-0.00	a

ESL is English as a second language.

\* Significant at  $p < .05$ . \*\* Significant at  $p < .01$ . \*\*\* Significant at  $p < .001$ 

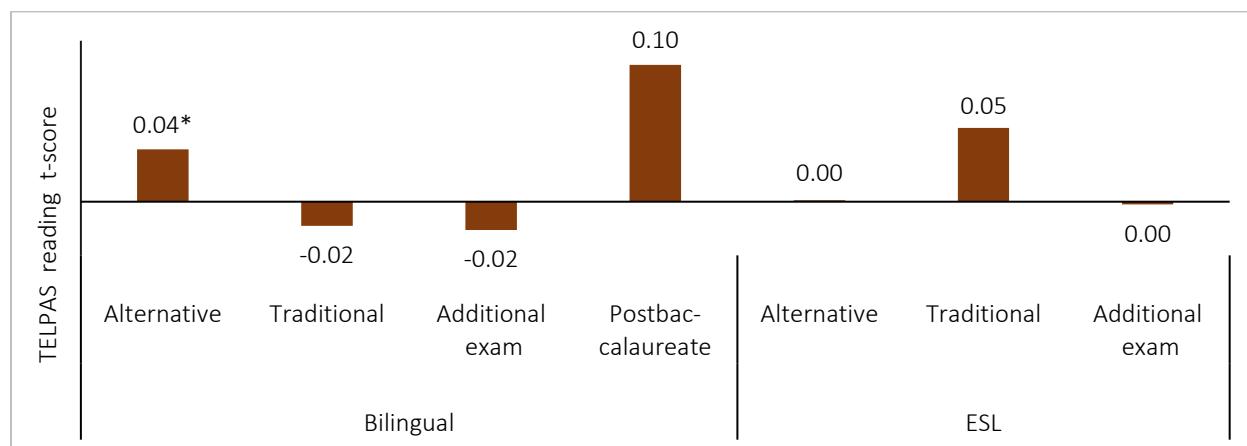
a: data are missing due to the small sample size for the specific route.

Source: Authors' analyses of data provided by the Houston Independent School District and the Texas Educational Research Center at the University of Texas at Austin.

Bilingual teachers from alternative routes were associated with greatest growth in grade 5 English proficiency compared with teachers certified through other routes.

The analyses on English proficiency outcomes in grade 5 suggested that bilingual teachers certified through alternative routes were associated with the most growth in English proficiency compared to bilingual and ESL teachers from other routes and compared to teachers with no bilingual or ESL certification (see figure 6). Specifically, only one of the four routes to bilingual certification was associated with a positive and significant effect on English proficiency growth: alternative. Students assigned to bilingual teachers from traditional, additional exam, or postbaccalaureate routes did not experience significantly different growth in English proficiency compared to students assigned to teachers with no bilingual or ESL certification. Having an ESL teacher regardless of route was not associated with English proficiency growth in grade 5.

**Figure 6. Bilingual teachers from alternative certification routes were associated with English learner students' greatest English proficiency growth in grade 5**



ESL is English as a second language. TELPAS is Texas English Language Proficiency Assessment System.

\* Significant at  $p < .05$ . \*\* Significant at  $p < .01$ . \*\*\* Significant at  $p < .001$

Note: The postbaccalaureate route for ESL teachers is not included in the figure because no observations were available.

Source: Authors' analyses of data provided by the Houston ISD and the Texas Educational Research Center at the University of Texas at Austin.

The estimated effect size of bilingual teachers from alternative routes on students' English proficiency growth was 0.04 compared to students taught by bilingual teachers certified through any other route, or by ESL teachers from any route, or by teachers with no bilingual or ESL certification (figure 6 and table 2).

The results suggest that for grade 4 teachers of English learner students whose home language is Spanish, it may be preferable to assign bilingual teachers certified through alternative routes to teach math; bilingual teachers certified through traditional routes to teach reading; and bilingual teachers certified through postbaccalaureate routes to work with English learner students in need of support with English proficiency.

When considering allocating teachers to English learner students whose home language is Spanish in grade 5, the results suggest that bilingual teachers were associated with lower growth in math, and they were not associated with significantly different growth in reading compared to teachers with no bilingual or ESL certification. These results would support school leaders allocating scarce bilingual teachers to teach math and reading to grade 4 students but allocating bilingual teachers certified through alternative routes to work with grade 5 English learner students in need of support with English proficiency.

## Limitations

This study has several limitations. First, the results of this study are not necessarily generalizable to bilingual and ESL teachers assigned to English learner students whose home language is Spanish in other school districts in the state or region. The study was conducted in Houston ISD, the largest of 11 major urban school districts in Texas.<sup>2</sup> Due to its size, location, and context, Houston ISD attracts and retains certified bilingual and ESL teachers who do not necessarily match the average certified bilingual and ESL teachers in the state (e.g., bilingual and ESL teachers certified through programs serving only the greater Houston area).

Second, the student and teacher characteristics used in this study to carry out the analysis do not represent all possible characteristics that may be associated with students' English proficiency scores or math and reading achievement. For example, REL Southwest did not have access to data on individual or family factors such as student motivation, parental involvement, parental education expectations, or household income, all of which may be related to education outcomes for English learner students. Also not included in the analyses were measures of the amount of instructional time that English learner students received in English each year, the structure of services provided to these students in the bilingual and ESL classrooms, or data on teacher fluency in Spanish, which has been shown to be positively associated with English learner student achievement in math and reading in other studies (Loeb et al., 2014).

Third, the associations of teacher certification characteristics with English learner student achievement growth measures are based on correlation analysis, so causal inferences cannot be made.

A fourth limitation of this study is its inability to examine English learner students separately by English proficiency, specifically looking at beginning and nonbeginning English learner students, as was the original design of this study. This was not possible due to the small percentage of English learner students at the beginning level of English proficiency in the original samples (between 3 percent and 5 percent in grade 4 and less than 1 percent in grade 5). This meant that there were very few teachers with enough beginning English learner students to carry out the analyses separately for students at the beginning and nonbeginning proficiency levels separately.

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<sup>2</sup> A district is classified as major urban if (a) it is located in a county with a population of at least 950,000; (b) its enrollment is the largest in the county or at least 70 percent of the largest district enrollment in the county; and (c) at least 35 percent of enrolled students are economically disadvantaged. A student is reported as economically disadvantaged if he or she is eligible for free or reduced-price lunch under the National School Lunch and Child Nutrition Program.

Despite these limitations, the study does contribute to understanding the relationship of teacher certification types and routes and growth in math, reading, and English proficiency among English learner students in grades 4 and 5 in Houston ISD.

# Appendix

The tables in this appendix specify the state assessments used in the analyses by grade and cohort (table 1), provide the total number of students and teachers used—by grade, subject and state assessment—to answer the research questions (table 2), and show the proportion of math and reading teachers that had bilingual and ESL certification by grade, subject, and assessment (table 3).

**Table 1. Student cohorts included in the study, by state assessment program**

School year	State assessment	Grade 4	Grade 5
2005/06	TAKS and TELPAS	C1	na
2006/07	TAKS and TELPAS	C2	C1
2007/08	TAKS and TELPAS	C3	C2
2008/09	TAKS and TELPAS	C4	C3
2009/10	TAKS and TELPAS	C5	C4
2010/11	TAKS and TELPAS	C6	C5
2011/12	STAAR and TELPAS	C7	C6
2012/13	STAAR and TELPAS	C8	C7
2013/14	STAAR and TELPAS	C9	C8
2014/15	STAAR and TELPAS	C10	C9

C1–C6 represent the six cohorts in grade 4 with TAKS and TELPAS scores.

C7–C10 represent the four cohorts in grade 4 with STAAR and TELPAS scores.

na is not applicable. STAAR is State of Texas Assessments of Academic Readiness. TAKS is Texas Assessment of Knowledge and Skills. TELPAS is Texas English Language Proficiency Assessment System.

Note: Grade 3 test scores were used as a pretest for the grade 4 cohorts, and grade 4 test scores were used as a pretest for the grade 5 cohorts.

Source: Data were obtained from authors' analyses.

**Table 2. Student and teacher overall and analytic sample sizes by grade, subject, and assessment program**

Cohorts	Program	Math				Reading			
		Overall		Analytic sample		Overall		Analytic sample	
Students	Teachers	Students	Teachers	Students	Teachers	Students	Teachers	Students	Teachers
<b>Grade 4</b>									
C1–C6	TAKS	33,714	1,596	24,722	630	26,821	1,053	21,646	521
C7–C10	STAAR	25,976	1,298	20,505	611	18,326	727	15,888	443
<b>Grade 5</b>									
C1–C5	TAKS	19,072	1,034	14,616	415	13,728	641	10,875	302
C6–C9	STAAR	18,495	933	15,093	435	11,461	561	9,850	323
<b>English proficiency</b>									
Overall		Analytic sample							
Cohorts	Students	Teachers	Students	Teachers	Students	Teachers	Students	Teachers	Students
<b>Grade 4</b>									
C1–C10	43,996	1,510	38,716	809					
<b>Grade 5</b>									
C1–C9	25,189	1,024	21,796	532					

STAAR is State of Texas Assessments of Academic Readiness. TAKS is Texas Assessment of Knowledge and Skills.

Source: Authors' analyses of data provided by the Houston ISD and the Texas Educational Research Center at the University of Texas at Austin.

**Table 3. Certification status of bilingual and ESL teachers in the sample by grade and cohort range**

	Grade 4 (percentages)		Grade 5 (percentages)	
	2005/06– 2010/11	2011/12– 2014/15	2006/07– 2010/11	2011/12– 2014/15
<b>Bilingual teachers</b>				
<b>Math</b>				
Fully certified	39.6	41.2	33.2	36.6
Not fully certified	60.4	58.8	66.8	63.4
<b>Reading</b>				
Fully certified	39.3	43.2	34.5	39.1
Not fully certified	60.7	56.8	65.5	60.9
<b>ESL teachers</b>				
<b>Math</b>				
Fully certified	51.1	56.8	57	56.7
Not fully certified	48.9	43.2	43	43.3

Reading				
Fully certified	52.7	57.6	48.7	58.5
Not fully certified	47.3	42.4	51.3	41.5

ESL is English as a second language.

Note: Percentages may not add up to 100 due to rounding.

Source: Authors' analyses of data provided by the Houston ISD and the Texas Educational Research Center at the University of Texas at Austin.

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