

## Strange as it may seem, new evidence shows it's better to know two languages but be taught math in English.

**B**ILINGUAL EDUCATION IS ONE OF the most intensely contested features of the contemporary education landscape. Initially legislated as a pedagogical tool to address lagging Hispanic performance, its early proponents argued that students with limited English proficiency (LEP) would benefit from deferring the transition to English so they could concentrate on core curricular skills in subjects such as mathematics and science. Over time, bilingual education has developed a professional following and an expanded charter that includes objectives not originally intended, such as the retention of languages and cultural traditions.

The competing pedagogical model for teaching LEP students is known as English as a Second Language (ESL) instruction. ESL is essentially a program of English immersion with special instruction geared toward the acquisition of English-language skills. LEP students spend the bulk of their school day in the regular classroom, receiving all instruction in English. In the ESL facet of the program, the children are pulled out of the classroom and meet in small groups with language specialists. The objective is to establish English fluency as quickly as possible, since language acquisition is easiest at young ages. Any delay in curricular learning can be compensated for, the theory goes, but inadequate learning of English will plague students through their school years and well beyond. Social concerns also play a prominent role in support for English immersion programs, as many opponents of bilingual education worry not just about its academic impact but also that it could lead to the fracturing of American society along ethnic lines.

The merits of bilingual education vis-à-vis ESL are not illuminated sufficiently by research. The substantial literature comparing the performance of bilingual education with ESL or complete immersion presents us with highly mixed conclusions.

The central weakness in existing studies of bilingual edu-

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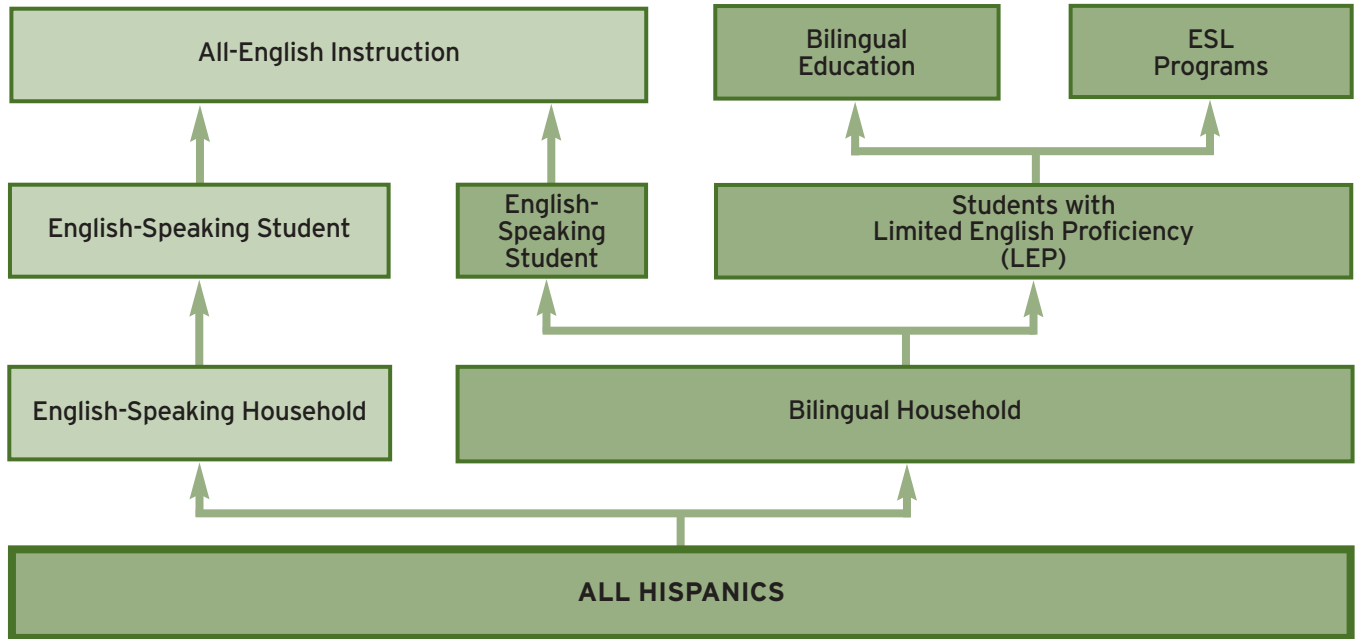
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## Sorting Process (Figure 1)

*Children from bilingual households are given a proficiency test. Those who are not proficient in English are steered toward language-acquisition programs—either bilingual education or English as a Second Language (ESL) programs.*



cation is that they do not attempt to separate the benefits of growing up in a bilingual household from the effects of receiving bilingual instruction. Well over half of all language-program participants in public schools are U.S.-born, and more than a third have two U.S.-born parents. Yet the independent effect of being raised in a bilingual household has been ignored in the literature. This is at odds with the findings of numerous linguists who have shown that knowing more than one language can provide the speaker with cognitive flexibility and an expanded basis for other fields of study. Likewise, economists have documented the existence of a language premium that accrues to fluent foreign language speakers in the labor market. Here I incorporate these notions into a more robust model for assessing the effects of language programs on long-term outcomes for LEP students. My results confirm that disentangling the effects of being raised in a bilingual household from the effects of receiving bilingual education in school offers substantial clarity and insight.

### Background

Bilingual education was first legislated at the national level with Title VII of the Elementary and Secondary Education Act

of 1968. This legislation encouraged the development of bilingual education programs by offering grants for innovative programs that addressed the needs of non-English-speaking students. The landmark 1974 Supreme Court decision in *Lau v. Nichols* created a national mandate. The Court ruled that school districts were obligated to take “affirmative steps” to overcome education barriers faced by non-English speakers. That same year, Congress passed the Equal Educational Opportunity Act, extending the *Lau* ruling to all schools.

Over the years amendments have expanded the scope of Title VII to permit the enrollment of English-speaking students (1978), to include the maintenance of students’ native languages (1984), and to emphasize teacher training (1984, 1988). The most significant legislation to limit the scope of Title VII came in the form of amendments to fund “special alternative” English-only programs and to limit most participation in Title VII programs to three years (1988). The much larger Title I program, which sponsors compensatory education for disadvantaged students, also funds programs, usually of the ESL variety, for LEP students. Nevertheless, Title I and Title VII programs can be coordinated at the state level to provide bilingual programming. In 2001 funding for

Title VII and Title I programs totaled \$180 million and \$10 billion, respectively.

The U.S. Department of Education broadly defines bilingual education as any teaching method involving the use of two languages. Bilingual education programs, as opposed to English immersion or ESL programs, can be further differentiated:

- *Transitional bilingual education* initially provides most instruction in students' (non-English) first language, with increasing proportions of English instruction over time. The objective is to prepare students for all-English classrooms while not falling behind in nonlanguage subject areas.

- *Developmental bilingual education* seeks to develop students' first language and English language skills concurrently, with the ultimate objective of full fluency in both languages.

A survey conducted by the National Center for Education Statistics during the 1993–94 academic year found that approximately a third of schools enrolling LEP students offered both a bilingual and an ESL program; 71 percent of LEP students attended one of these schools. Bilingual education programs were available at 36 percent of schools enrolling LEP students, while ESL programs could be found at 85 percent of these schools. Thirteen percent of schools with LEP students, attended by just 3 percent of LEP students, offered neither ESL nor bilingual programs.

In 1990, 6.3 million school-aged children (10 percent of the nation's total school enrollment) spoke a language other than English at home; of those, 2.4 million were not fully proficient in English. Today there are more than 4 million LEP students enrolled in the school system. Hispanic students, the focus of my analysis, account for more than three-fourths of the LEP population and an even greater proportion of bilingual education participants.

The process of sorting students into special language programs typically involves administering a home language survey and, if two languages are spoken at home, following up with an English proficiency exam. Students identified as having limited English proficiency are then offered some form of language assistance. Parents have the right to petition to have students placed into or out of bilingual education programs, but they may in practice defer to the judgment of teachers or administrators. Figure 1 illustrates how Hispanic students are selected for bilingual education and ESL programs.

## The Literature

Research in the field of linguistics reveals the natural tension within special language programs—namely, that instruction in two languages can provide benefits, while delaying the transition to English can be costly.

Within the linguistics community, it is widely accepted that knowing more than one language leads to greater cognitive flexibility. Underlying this belief is the notion that cognitive processes are largely enabled by vocabulary and syntactical ability. More vocabulary means more understanding, and diversified syntactical skills result in greater mental agility—both of which lead to enhanced cognitive processes.

A number of studies provide evidence that bilingualism can positively affect intelligence. The groundbreaking study associating bilingualism with cognitive ability was published in 1962 by psychologists George Peale and Wallace Lambert. More recently, Stephen Bochner in 1996 and Babu Nandita in 1984 used modern experimental techniques to confirm the beneficial effects of bilingualism. In a series of four studies involving 496 above-average students aged 14 to 16, Bochner assessed learning strategies using tests of cognitive processes. Bilingual subjects were found to exhibit superior learning strategies after controlling for social factors, gender, language proficiency, intelligence, scholastic achievement, and educational opportunities. Nandita identified indirect cognitive benefits among average children using tests designed to introduce syntactic ambiguity; the testing revealed that bilingual children employed more advanced cognitive and linguistic strategies to resolve such ambiguities than did monolingual children.

Various linguistic theories also apply to the design of language acquisition programs. Of special note is the *sensitive period hypothesis*, which asserts that ability in the various elements of language acquisition peaks at specific ages and diminishes rapidly thereafter. Failing to develop critical language elements by the prescribed time makes it much harder to achieve parity. Furthermore, native-like fluency may be unattainable when key points in its development are missed. There is practical consensus on the validity of the sensitive period hypothesis for second-language acquisition and on the broad time band, or window of opportunity. It is generally agreed that, to achieve native-like fluency in a second language, the latest a child should begin acquiring primary elements of the second language is age six, and the latest for the final elements is age twelve. Ability level and acquisition rate diminish quickly for each element after the window begins to close.



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## Theoretical Approach

The fundamental difference between the two major approaches to language programming for LEP students is timing. Bilingual instruction carries with it the assumption that delaying the transition to English is less costly than delaying the acquisition of other core skills; it is more important to introduce critical topics in mathematics and science at the most appropriate time, even if the instruction must be in the student's first language. ESL instruction assumes the opposite—that the benefits of learning English as early as possible exceed the costs of delaying other core curricula. Both philosophies maintain the importance of early investment in core skills, but they part ways on the ideal order of presentation. My research compares the costs of delaying the transition to English with the benefits of presenting other skills as early as possible in the student's first language. Crucial to this task is distinguishing the effects of bilingual instruction from the effects of being bilingual, which may have beneficial effects for students independent of their education program. The mixed results of earlier studies may be partially explained by their failure to separate the two effects.

Another important consideration is that curricular skills and language deficits both grow over time. This means that earlier training is better than later training, and skills continue to compound even after formal instruction is interrupted. For example, learning to add in the 1st grade is better than learning to add in the 6th grade. Even if 1st grade math is never built on in later grades, a student's addition and subtraction skills are still likely to improve somewhat by the 6th grade. A language deficit grows similarly over time. An LEP student who concentrates exclusively on learning English in the 1st grade will expend less of his available schooling time to clear the fluency threshold than if the English transition were postponed until the 6th grade. This increased difficulty has two components, one stemming from the need to play catch-up as a student gets older—fluency for a 6th grader spans more language skills than does fluency for a 1st grader—the other stemming from a decreasing facility for acquiring language, as implied by the sensitive period hypothesis.

Assuming that all students leave high school fully fluent in English, these considerations suggest that the optimal choice of language acquisition program depends on a tradeoff between acquiring curricular skills on the one hand and accumulating language deficits on the other. Students whose transition to English is delayed in the interest of learning mathematics, science, and reading and writing in their native language will inevitably have more difficulty learning English, and that difficulty may

have long-term consequences. By contrast, students whose curricular learning is delayed in order to speed their transition to English will suffer some curricular setbacks that must be compensated for in later periods. As long as the effects of bilingual instruction and of living in a bilingual household are not mutually dependent (for example, the effects of receiving bilingual education are the same regardless of what type of household you grew up in), the choice of program suggested by this tradeoff will be the same for all students, regardless of individual ability.

One can evaluate this tradeoff empirically by comparing the education and labor market outcomes for students who have received various forms of bilingual instruction. For instance, one can estimate the premium of living in a bilingual household by contrasting Hispanic students who grew up in a bilingual household but whose English is functional with otherwise comparable Hispanics who were raised speaking only English. Similarly, one can estimate the effect of instruction in two languages by comparing students whose transition to English was delayed (who were taught curriculum in their native language while receiving supplemental English instruction) with those who grew up in bilingual households but are English functional. Another way of estimating the effect of bilingual instruction is to compare students who received bilingual instruction with those who were immersed in English-only programs from the start. I use both strategies in attempting to estimate the effects of bilingual education, thus generating two estimates.

### Data

Currently, the survey offering the best combination of language program exposure and long-term outcomes is High School and Beyond, a longitudinal study sponsored by the National Center for Educational Statistics. The High School and Beyond base-year survey, conducted in 1980, included more than 50,000 high-school sophomores and seniors, with language program data collected on more than 11,000 base-year participants. The survey provides data on wages and occupations going 10 years past high school as well as clear indicators of whether students participated in ESL or bilingual education programs. My analysis focuses exclusively on Hispanic students from the sophomore cohort in High School and Beyond's fourth follow-up survey. There are 12,640 complete responses from this cohort, 1,983 of which are from Hispanic students.

The High School and Beyond surveys yield four outcome variables that are useful for this analysis: years of education, degree



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attainment, wages, and occupation. The degree-attainment variable records the highest level of formal education achieved by Hispanics at the time of the last follow-up survey. Another variable identifies respondents' occupations according to 29 categories. For this analysis, a new variable was created by separating the 29 occupational categories into two classifications: nonprofessional and managerial/professional/business owner.

The High School and Beyond data have limitations. Namely, a small percentage of students reported participating in both ESL and bilingual education programs, thereby making it necessary to exclude them from much of the analysis. But the likelihood of being assigned to a bilingual education or an ESL program is remarkably consistent across regional and national origin categories, indicating that the implementation of language programs nationwide was sufficiently uniform to group the remaining observations together.

In this analysis, I attempt to control for a variety of potential selection biases. The procedures for assigning students to special language programs—the home language survey and the LEP test—naturally lead to selection biases. It is broadly agreed that these biases have a negative net effect on assessments

of the performance of bilingual education programs. For example, it is commonly alleged that because Spanish fluency is not normally measured, students who should otherwise be placed in Title I programs for challenged students are routinely assigned to bilingual education programs.

Before discussing selection that would bias assessments of special language program performance downward, I will address two factors that could introduce upward biases. The first is specific to the High School and Beyond survey and, indeed, to any survey that uses a high-school cohort—the dropout rate. High School and Beyond surveyed a cohort of high-school sophomores; any dropouts who left school before the initial survey will be missed. If Hispanics drop out at rates that differ according to the language program they participated in, it could influence the results. There are mixed results among the several studies that have examined this issue. Some studies find lower dropout rates among bilingual education participants, while others find that bilingual education participants are more likely to drop out of high school.

Another potential upward bias on assessments of special language programs, particularly bilingual education programs, is



*Achieving functional fluency in a second language at a young age yields substantial cognitive benefits.*

differences in opportunity. If bilingual education programs are more available in districts with better funding or in metro areas with greater postsecondary and labor market opportunities, then participants may realize superior outcomes just because of where they happen to live.

A number of factors would be expected to impose downward biases on assessments of bilingual education. One specific to this data set is the maturity of bilingual education programs at the time the sophomore cohort entered the school system. A student from the 1980 sophomore cohort who did not skip or repeat any grades would have entered kindergarten in 1970, just two years after the Title VII legislation and four years before the landmark *Lau v. Nichols* ruling that provoked the large-scale introduction of bilingual education programs. Clearly, bilingual education was in a developmental stage when the sophomore cohort entered school. Apart from program maturity, the continuity of bilingual instruction for students during this period is almost certain to have been less than ideal. This plainly represents the most serious limitation of the High School and Beyond data set for estimating the effects of bilingual education. However, no other data set combines measures of early exposure to bilingual education programs with measures of students' outcomes 10 years after high school. And potential concerns about the accuracy of the information it contains on language programs are mitigated considerably by a National Center for Educational Statistics follow-up survey that largely validated the accuracy of the program exposures initially recorded.

## Results

My analysis of this data set introduces two empirical innovations on previous studies consistent with the theoretical approach developed above. The first is the inclusion of Hispanics who speak only English, in order to compare their performance with that of students from bilingual households. This is necessary to estimate the premium associated with being bilingual. Other studies have only compared ESL with bilingual education students and thus have been unable to separate the effects of being bilingual from those of bilingual instruction.

The second innovation is the use of the Hispanic cohort's 10th grade basic math scores as a control for performance-based selection biases among the different language treatments. To the extent that basic math is fully transferable across languages, it is reasonable to expect math instruction to be comparable for different language treatments. The more important distinction in math instruction is a time-on-task difference between LEP and non-LEP students. Those with incoming language deficits have less time available to learn the general curriculum. On this basis, LEP students should be expected to exhibit lower math scores than comparable non-LEP students, all else being equal. This is because clearing the language deficit leaves less of their time for everything else (including math).

In an initial comparison, ESL students appear to fare better than those receiving bilingual instruction on each of the outcomes examined. Students taught in ESL programs obtained three-quarters of a year more education than students in bilingual education programs, a premium reflected in the fact that 10 percent

of ESL students received bachelor's degrees, compared with 7 percent of bilingual education students. ESL students earned, on average, nearly \$1,000 more per year than students receiving bilingual instruction, and they entered high-skill professional occupations at almost twice the rate of bilingual education students (36 percent versus 19 percent). Outcomes were consistently worse for students receiving both ESL and bilingual instruction, perhaps due to the disruptive effects of being exposed to two diametrically opposed methods of language acquisition. These students are excluded from the remainder of the analysis because they don't allow comparison of the two methods. The final comparison was between students in bilingual households whose instruction was all in English and students in English monolingual households. Students from bilingual households obtained .6 more years of education and earned bachelor's degrees at three times the rate of Hispanics in English monolingual households (15.6 percent versus 4.6 percent). They also entered high-skill occupations at twice the rate of English monolinguals.

Although suggestive, these differences in outcomes could reflect differences in the characteristics of students placed in ESL or bilingual education programs or differences in the opportunities available to them because of where they live. However, similar patterns were repeated in the multivariate analysis designed to account for such factors. Even controlling for such variables as socioeconomic status, 10th grade math scores, parents' birthplace, sex, and region, bilingual education has unambiguously negative effects on both years of education and attainment of a degree. Students taught using bilingual education methods obtained 0.6 years less schooling and were also less likely to obtain a college degree. Living in a bilingual household, by contrast, had a positive effect on both measures of education attainment: it added 0.3 of a year to a student's years of education and increased the probability that students would complete college. Students receiving bilingual instruction were also less likely to be in a high-skill occupation, although differences in the wages earned by the two groups were not statistically significant.

For both measures of education attainment, then, the influences of living in a bilingual household and of receiving bilingual instruction were roughly similar in strength, but opposed in sign—bilingual households being a positive influence, bilingual instruction being a negative one. This points to a possible cause for mixed results in the literature: conflating the two effects leads to muted results even though both are individually quite strong.

Another noteworthy finding is that students from bilingual households placed in ESL programs appear to fare better than their non-LEP counterparts despite their initial deficiency in English. This suggests that negative selection effects into ESL programs are actually rather small. We can likely infer the same about bilingual instruction programs, which are subject to a similar selection process. The absence of substantial selection effects may reflect the fact that the cutoff for placement into a special language program is typically the 40th percentile on

a test of English proficiency. Students just above this cutoff may still have a significant, though smaller, language deficit to overcome.

Finally, the strong performance of students receiving ESL instruction also seems to indicate an element of sink or swim among bilingual students taught in regular classrooms. Although they receive more instruction in English sooner than other students, the lack of additional assistance may stall their progress. ESL programs seem to smooth out, and presumably speed up, their transition.

## Conclusion

This analysis identifies a large education premium accruing to Hispanics raised in Spanish-speaking households. All else being equal, those from Spanish-speaking households, even when entering the school system with limited English proficiency, fare significantly better than Hispanics who speak only English. The best performance is found among students from Spanish-speaking households who make a rapid transition to English, either through English as a Second Language programs or through English immersion. The clear indication is that any positive returns owing to bilingual instruction are outweighed by the associated costs of delaying transition to English.

These results suggest several principles for the design of effective language-acquisition programs. Primary among them is the importance of timing. For children who have not achieved English fluency by the 1st grade, the clock is ticking; not attending to deficiencies in English by the critical age of five or six makes catching up much more costly. It is imperative that the English deficiencies of these children be fully addressed sooner rather than later.

Nevertheless, entering school with substantial non-English language skills should not be viewed as a detriment. Achieving functional fluency in a second language at a young age yields substantial cognitive benefits. Although any English deficiencies should be addressed immediately, it remains an open question when students should be encouraged to resume training in their non-English first language. Any such training should be undertaken voluntarily according to tastes and abilities.

Continuing to apply a distinct and unproven education pedagogy to a large class of new Americans is an invitation to a variety of social problems. Chief among them is the exacerbation of the problems the pedagogy was originally intended to address—namely, low academic performance and limited economic opportunities. Intended or not, this has been the result of applying the unproven pedagogy of bilingual education to millions of U.S. Hispanics.

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